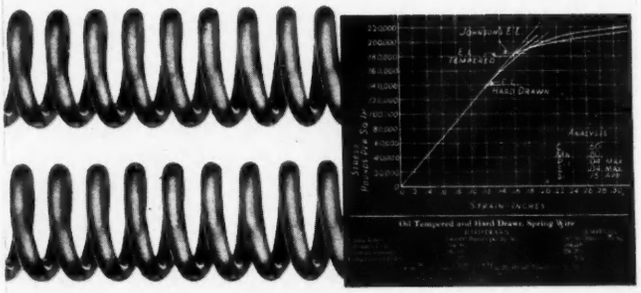
the elastic limits of steel wire

CAN BE VARIED



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For example, a spring made from hard drawn wire will take a permanent set under less load than will a spring of the same design made from oil tempered wire. The tempered wire has a higher elastic limit even though the tensile strength is not increased.

As it costs more to develop a high elastic limit, it is important for the wire user to know just what wire is the best and most economical for his purpose. Wickwire Spencer Steel Company's Engineers will gladly help you to make the proper selection.

Wickwire Spencer manufactures High and Low Carbon Wires—in various tempers, grades and finishes—for your specific purpose. Hard-Drawn, soft or annealed Basic or Bessemer Wires—Hard-Drawn annealed, or oil-tempered Spring Wire, Chrome Vanadium Spring Wire—Valve Spring—Music—Clip—Pin—Hairpin—Hook and Eye—Broom—Stapling—Bookbinding—Dent Spacer Wire—Reed Wire—Clock—Pinion—Needle-Bar—Screw Stock—Armature Binding — Brush — Card—Florist—Mattress—Shaped—Rope—Welding. Flat Wire and Strip Steel, High or Low Carbon—Hard, annealed or tempered—Clock Spring Steel—Corrosion and Heat Resisting Wires.

WICKWIRE SPENCER STEEL COMPANY
New York Worcester Buffalo Chicago San Francisco

DETROIT REPRESENTATIVE:
CRAINE-SCHRAGE STEEL CO.
8701 Epworth Boulevard

VISSCO WIRE
by Wickwire Spencer

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Reg. U. S. Pat. Off.
Published Weekly

Volume 78 Number 11

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P. M. HELDT, Engineering Editor — J. B. POLLOCK, Ass't Editor
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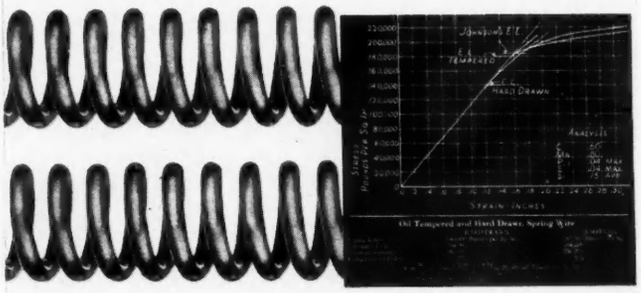

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AUTOMOTIVE INDUSTRIES

Published Weekly
Founded 1895

March 12, 1938
Vol. 78, No. 11

Production

. . . livelier movement of new cars and trucks by dealers reflected in increasing volume of factory orders

Retail deliveries of new cars and trucks by dealers are beginning to have their effect on orders received by the factories with the result that this week's output will show a slight but encouraging increase over that of a week ago.

Seasonal influences are credited largely for this improvement inasmuch as this week's production was based almost entirely on orders received before results from the industry's intensive "National Used Car Exchange Week" had begun to accumulate. Another week will pass before definite figures will be available on the effects of this used car drive, but fragmentary preliminary reports received by factories show that buyers definitely are responding and that if the pace set during the first two days of the drive is maintained results will exceed expectations.

Ford dealers, for example, reported that Saturday, March 5, was one of the largest single used car sales days in the 35-year history of the company. Sales for that day were three times as great as the daily average of the preceding 10-day period, according to John R. Davis, Ford general sales manager. Ford dealers, he said, sold 10,000 used cars against 3400 average daily sales for the last 10 days in February.

A number of producers have stepped up their working week.

(Turn to page 375, please)

Labor

Martin UAW Administration Encountering Stiff Opposition In Local Elections

Both "pro" and "anti" Martin factions claimed important victories this week in the elections being held currently by locals of the United Automobile Workers Union in all parts of the country. Although several weeks will elapse before all of the locals have completed their balloting and before there will be a definite answer on the actual strength of Homer A. Martin, UAW president, it is evident that the present UAW administration is encountering stiff opposition.

Martin's office as president is secure for the next 18 months regardless of the outcome of the current elections but result of the voting is

(Turn to page 379, please)

A.P.E.M.

Newly Elected Directors Introduced at Annual Meeting of Association in Detroit

Heads of the automobile manufacturing industry were guests of the Automotive Parts and Equipment Manufacturers, Inc., at their annual meeting in the Book-Cadillac Hotel, Detroit, March 10.

Featured speaker at the dinner was George Sokolsky, authority on labor and economic problems. The Association introduced its newly elected directors as follows:

Directors at Large—F. C. Crawford, president, Thompson Products, Inc.; C. S. Davis, president, Borg-Warner Corp.; M. C. De Witt, vice-president, Champion Spark Plug Co.; Charles Getler, president, Houdaille-Hershey Corp.; J. P. Mahoney, vice-president, Bendix Products Corp.; H. C. Weed, vice-president, Carter Carburetor Corp.; C. E. Wilson, vice-president, General Motors Corp.

Original Equipment—C. C. Carlton, secretary, Motor Wheel Corp.; Replacement Parts—D. W. Rodger, vice-president, Federal Mogul Corp.; Accessories—C. C. Bradford, president, Eaton Products, Inc.; Electrical Products—D. H. Kelly, vice-president, Electric Auto-Lite Co.; Shop Equipment—E. A. Hall, president, Hall Mfg. Co.; Internal Combustion Engines—E. F. Deacon, president, Climax Engineering Co., and Service Tools—J. E. Otis, Jr., president, Stewart-Warner Corp.

WHO'S WHO IN A. S. T. E.

About Officers of the American Society of Tool Engineers Which Holds the Stage at Detroit This Week (See Article on Page 373)

FRANK A. SHULER, present president of the A.S.T.E. previously served the society in the capacity of director and first vice-president. During his administration of the past year, the A.S.T.E. doubled in size with addition of seven new chapters. Mr. Shuler is master mechanic of the Highland Park plant of the Chrysler Corp.

J. A. SIEGEL, one of the society's charter members, served as its first president and, later, director. As present chairman of the entertainment committee he is in charge of the entertainment being offered at the current exhibition. He is affiliated with the Packard Motor Co., Detroit, as assistant tool and die designer.

LUKE E. BEACH has served the A.S.T.E. first as a director, then as second vice-president and is now serving as first vice-president. A tool designer for many years, he has for the past four years been with the Packard Motor Co., main division, as processing engineer and is now supervisor of processing.

WALTER F. WAGNER, second vice-president of the society, has served also as a director. His entire business life has been spent in the automotive field in various phases of tool designing. He is employed as mechanical superintendent for the Lincoln Motor Car Co. where he has been since 1922.

FRANK R. CRONE is a charter member of the A.S.T.E. He has served on the board of directors and at present is national treasurer of the society. This office he has held for the past two years. Since the close of the World War, Mr. Crone has been with the Lincoln Motor Car Co. where he is now chief tool designer.

FORD R. LAMB is another charter member of the society. He has served as a director, vice-president and president and, in May, 1937, became executive secretary. He has been engaged in the tool engineering profession for more than 20 years and is known for his inventions in that field.

(See page 372)

MEN OF THE INDUSTRY

JOHN G. MARTIN has been appointed director of Motor Clinics of the Ethyl Gasoline Corp., a new executive post.

CHARLES L. WEDOW has been named manager of the Chicago sales office of The National Screw & Mfg. Co., Cleveland. Before joining this company last year, Mr. Wedow was associated with the Cleveland Cap Screw Co., and prior to that connection had served for some years as sales manager of the Superior Screw & Bolt Co.

HAROLD CRIST has been named factory superintendent of the American Bantam Car Co., Butler, Pa. Crist was formerly with the Marmon Motor Co., Indianapolis, Ind., the Stutz Motor Car Co. of Indianapolis and prior to that with the Maxwell Motor Co. of Newcastle, Ind.

LOUIS J. PURDY has been appointed general manager of the Dodge Truck Division of Chrysler Corp.

Who's Who In A.S.T.E.

(Continued from page 371)

C. RAY BRUNNER has served the A.S.T.E. first as a director and, during the last two years, as national secretary. For the past 15 years he has been with the Dodge main plant as tool designer and later as a tool engineer. At present he specializes in the tooling of parts going into the engines made at that plant.

Marmon-Herrington to Establish Two Factories in Canada

The Marmon-Herrington Co., Indianapolis, Ind., has announced completion of arrangements for the establishment of factories for the manufacture of its all-wheel-drive vehicles at two points in Canada.

A factory to serve western Canada will be located at 650 Burrard Street, Vancouver, British Columbia, and will operate under the name of Truck Parts and Equipment, Ltd. The territory from the prairie provinces to the maritime provinces will be served by Canadian Traction, Ltd., 1396 St. Catherine Street. West, Montreal, Quebec.

Citroen Names M. Boulanger Chairman of Board

Following the death of Pierre Michelin, which was reported in AUTOMOTIVE INDUSTRIES of Jan. 15, 1938, M. Pierre Boulanger has been appointed chairman of the Board of the Citroen Automobile Co. M. Boulanger has long been connected with the Michelin firm in important posts and since 1935 has taken a prominent part in the rehabilitation of the Citroen company.

G. M. WALKER

. . . advertising manager of the Caterpillar Tractor Co. which recently was awarded first place by the "Awards Jury" for its 1937 advertising in trade and professional publications.

Orchids to Caterpillar

Tractor Company Wins Award for Its 1937 Advertising Campaign

The Caterpillar Tractor Co., Peoria, Ill., was awarded first place for 1937 advertising in trade and professional publications in the annual selection by the "Awards Jury" in New York. A medal accompanying the citation was presented recently to G. M. Walker, advertising manager of Caterpillar.

Decision of the jury rested on the campaign of the Caterpillar Tractor Co. in trade and professional publications which, the jury announced, was distinguished for technical excellence and ethical soundness. In this same classification, the coach division of General Motors Truck and Coach Co. received honorable mention.

Other awards of interest to the automotive world were: Medal award to the Bakelite Corp. for a campaign appearing in industrial publications which was distinguished for technical excellence and ethical soundness. Honorable mention in this classification went to the U. S. Steel Corp., for its series of advertisements on U.S.S. High Tensile Steels, and to the Torrington Co., for its series introducing its needle bearings.

U. S. Steel received also the medal award for a series of advertisements most distinguished by excellence of layout, art and typography.

Packard Motor Car Co. received honorable mention for a series of advertisements most distinguished by excellence of copy, and the Ford Motor Co. received honorable mention for a national campaign appearing in newspapers.

SAE Discusses Aircraft

Twelve Technical Papers Presented At Annual Washington Session

With more than 100 in attendance the first technical sessions of the Annual National Aeronautic Meeting of the Society of Automotive Engineers got underway Thursday morning, March 10, and continued to March 11, at the Mayflower hotel in Washington, D. C. Two sessions were held simultaneously the first morning, one on engines, the other devoted to aircraft. A. T. Colwell of Thompson Products presided at the engine session instead of Robert Insley, who was unable to be present. T. P. Wright presided at the aircraft session.

On the second day of the meeting, those in attendance had the opportunity of visiting either the Glenn L. Martin Co. plant in Baltimore, Md., or the Navy Yard, Washington, D. C. The latter included a trip to the Naval Gun Factory and the Göttingen type return flow wind tunnel.

Juan T. Trippe, Pan American Airways, spoke at the banquet held the evening of March 11. His topic was "America's Position in World Air Commerce."

Papers presented at the meeting were: "Torsional Vibration in Inline Aircraft Engines," by R. M. Hazen and O. V. Montieth, Allison Engineering Co.; "Carburetor Icing," by Rob't Sanders, Engineering and Research Corp.; "Bending Stresses in Box Seams as Influenced by Shear Deformation," by Paul Kuhn, National Advisory Committee for Aeronautics; "Recent Air Commerce Development in Instrument Landing," by I. R. Metcalf, Bureau of Air Commerce; "Ground Training for Instrument Flying," by Capt. C. J. Crane, Material Division, Wright Field; "Propeller Problems Imposed by Substratosphere Flight Requirements," by C. F. Baker, Hamilton Standard Propellers; "Propeller Factors Tending to Limit Aircraft Engine Powers," by G. T. Lampton, Lycoming division, Aviation Mfg. Corp.; "Aerodynamic Considerations Affecting Propellers for Large Aircraft Engines," by George Brady, propeller division, Curtiss Aeroplane Co.; "Private Flying," by Luis DeFlorez, consulting engineer, New York City; "Engines for Light Airplanes," by N. N. Tilley, Continental Motors Corp.; "Operating Characteristics of Large Seaplanes," by W. K. Ebel, Glenn L. Martin Co.; "Practical Aspects of Transocean Flying," by C. H. Schildhauer, Pan American Airways.

Willys First Quarter Earnings Reported at $15,024

Net earnings of $15,024 were reported by Willys-Overland Motors, Inc., for the first quarter of its current fiscal year ended Dec. 31, 1937, before provision for normal federal income tax. After deduction for tax the net earnings totaled $10,642 as compared with a net loss of $395,630 in the comparable quarter a year

ago, when the new company was just getting started.

Total assets of the company at Dec. 31 were $15,276,652. Current assets were $4,276,668 in ratio of 4.8 to 1 of current liabilities.

Federal Adds 14 New Models

The Federal Motor Truck Co., Detroit, Mich., has announced the addition of 14 new 6-wheel models to its present line of 43 models. The new models, ranging from two to eight ton capacity, include both conventional and cab-over-engine types.

A.S.T.E. Detroit Show

Society's First Machine and Tool Exhibition Highly Successful

First days' registration of 4600 members and guests of the American Society of Tool Engineers assured the success of the first Machine and Tool Progress Exhibition held in Detroit in conjunction with the annual meeting of the A.S.T.E.

There were approximately 160 exhibits of machine tools, small tools, gages, instruments and a variety of materials and attachments.

Prominent among the visitors were factory executives from various parts of the country, many of whom were outspoken in praise of the exhibits. The majority of exhibits featured equipment in action, this being particularly true of several of the latest type injection molding machines.

The first technical session held Wednesday evening was concerned with the standardization of the quality of machined surfaces. This was a brief report of progress of the A.S.A. sub-committee, presented by Dr. E. J. Abbott of Physicists Research Co. According to Dr. Abbott, the committee is aiming at the development of a standard expressed in numbers denoting the relative roughness of machined surfaces. It appears that the standard for roughness may have to be supplemented with another series of numbers denoting the waviness of surfaces.

The second section of Dr. Abbott's paper described his pioneer work in the development of the original profilograph as well as interpretation of its measurement of various kinds of surfaces. Latest development is the profilometer which is intended as a production testing instrument. A feature of this instrument is that it gives readings of average height of irregularities rather than a complete history of every part of the roughness profile. Brief discussion of the paper and its objectives was provided by H. T. Woolson, executive engineer, Chrysler Corp., R. V. Hutchinson, Olds Motor division of General Motors Corp., and F. J. Malone, Hercules Motors Corp.

80 M. P. G.

Humphrey Cissel of Rockville, Md., with his home-made midget automobile which is powered by a ½ hp. washing machine motor and is said to operate 80 miles to a gallon of gasoline at a speed of 10 m.p.h. Cissel estimates that it cost him $3. Incidentally, the license plates were 32 cents.

Seibelman photo

Emphasis on Physics

Kettering to Speak at Symposium On Physics in Automobile Field

Charles F. Kettering, director, General Motors Research Laboratories, is to be among those presenting papers at the symposium on physics in the automotive industry to be held under the auspices of the American Institute of Physics at Ann Arbor, Mich., March 14 and 15. The subject of Mr. Kettering's paper is "Scientific Training and Its Relation to Industrial Problems."

Other papers to be presented at the symposium are: "What Physics Can Do for the Automotive Industry," by F. K. Richtmyer, Cornell University; "Needs of the Automotive Industry for Fundamental Scientific Research," by Carl Breer, Chrysler Corp.; "Thick Film Lubrication in Journal Bearings," by M. Muskat and F. Morgan, Gulf Research Laboratories; "Some Aspects of the Modern Theory of Solids," by Frederick Seitz, General Electric Co.; "Electric Discharge Lamps as Highway Illuminants," by C. G. Found, General Electric Co.; "Some Factors Influencing the Flow of Physics into Industry," by E. J. Martin, General Motors Research Laboratory; "The Training of Physicists for Positions in the Automotive Industry," by J. S. Thomas, Chrysler School of Engineering; "The Physics of Rubber as Related to the Automobile," by W. F. Busse, B. F. Goodrich Co., research laboratory; "Photoelastic Analysis Practically Applied to Design Problems," by O. J. Horger, Timken Roller Bearing Co.; "A Few Instruments Used in Automotive Research," by E. J. Martin, General Motors Research Laboratory; "Studying Engine Combustion by Physical Methods," by Lloyd Withrow and G. M. Rassweiler, General Motors Research Laboratory; "Some Physical Problems in Noise Measurement," by Paul Huber, General Motors proving grounds; "The Mobility Method of Computing the Vibration of Mechanical Systems," by F. A. Firestone, University of Michigan.

40 Years Ago

with the ancestors of AUTOMOTIVE INDUSTRIES

Minor Mention

"The Electric Vehicle Co., operating the electric cabs in New York City, have secured the old armory, 1684 Broadway, where they will have abundant room for the 100 new vehicles which they propose to put in service in the spring. The company have secured as chief engineer, George Herbert Condict, one of the acknowledged authorities on storage battery traction in the United States. The Pope Manufacturing Co. also store their exhibition carriage at this place."

From *The Horseless Age*, April, 1898.

3000 PARTS James Beard, member of the engineering staff of the Studebaker Corp., and the gasoline-powered model airplane which he just completed after an estimated 900 hours of work in his home workshop. The miniature airplane is modeled after the transport type plane, with wings, fuselage, and tail construction similar to the Douglas DC-3. There are two exceptions, however, in Mr. Beard's design. It mounts one engine instead of two and carries pontoons instead of wheels.

Wingspread of the model is 66 in. and it weighs 3½ lb. ready for flight. Outer main wing sections are attached to the inner wing sections by means of preloaded shear pins to prevent serious damage in the event of a crash. Pontoons are similarly mounted. The entire ship is cellular in construction, pontoons having 17 watertight compartments to prevent sinking should the plane crash.

Bore and stroke of the two cycle, single cylinder engine are ¾ in. and 13/16 in. respectively. Mr. Beard is reported to have tested his engine a total of 50 hr., during 25 of which the engine was operated at 6000 r.p.m. In one test it is said that the engine was operated at 6000 r.p.m. full load, 27 minutes on one ounce of fuel. Engine and fuel tank are separated by fire-proof firewall. Fuel capacity is five ounces. The plane is equipped with an adjustable pitch propeller.

Another unique feature of the craft is the robot pilot that controls the ailerons in such manner as to offset the effect of engine torque while the plane is in flight. The robot can release the ailerons to landing position when the engine is shut off. By a special timing device, the robot is also said to be capable of shutting off the engine after a predetermined interval of flight.

New York Maintenance Show Scheduled for March 28 to 31

Promoted with the minimum amount of organization and entirely without professional show management, the Second Metropolitan Automotive Maintenance Show, March 28 to 31, Port Authority Building, New York, is nearing a sellout. Space reservations made to date by 74 equipment manufacturers is 50 per cent ahead of last year's showing, and nearly 40 jobbers, as compared with last year's two, have signed up for the show.

Walter V. Hall, New York representative of the U. S. Air Compressor Co., Cleveland, is serving both as show manager and secretary of the show committee's directorate, with Harry Aubinger, formerly with the National Standard Parts Association and long identified with the automotive parts and accessory industry, is his aide. Officers of the show are at the Hotel Empire, Broadway and 63rd Street, New York.

More than 150,000 tickets have been issued to automobile repairmen and service station managers and employes. A feature of the show will be mass demonstrations or lectures about tools, equipment, and supplies.

Step Up Tire Output

Gain for Akron District of 20% Expected by End of March

The long overdue pick-up in tire production in preparation for the seasonal spring consumer tire buying surge, has at last gotten under way in the Akron district. Manufacturers who had pared their production tickets to the bone in January and February have started to lengthen hours for present employes and to recall furloughed workers. The surge in tire building is expected to gain momentum. By the end of March, it should represent at least a 20 per cent gain over the February average, with further gains adding another 20 to 25 per cent to production and employment in April.

Against average production of approximately 4,600,000 tires per month in 1937 the industry sagged to a low of a scant 2,500,000 casings in February. By April 1 the monthly rate should be in excess of 3,000,000, and this should be stepped up to between 3,500,000 and 4,000,000 by mid-April.

At the Firestone Tire & Rubber Co., while no men are being recalled, the time of present workers in several departments is being stepped up from two days a week to four. Goodyear also reported slight increases in production tickets.

While finished tire inventories still are more than 10,500,000 casings, it is reported that many of these tires in stock are of the less-popular sizes, with stocks of the more-popular tire sizes largely depleted. Dealer stocks are relatively low, indicating that the industry will have to gradually increase production in certain tire sizes to keep the market amply supplied.

Goodrich Announces Tire With Non-Skid Tread

A new passenger car tire, incorporating unusual anti-skid qualities, was announced March 7 by the B. F. Goodrich Co. as the result of two years' research.

Secret of the tire's non-skid features lies in a tread design which, like a battery of windshield wipers, wipes wet pavements dry and sluffs away the water, permitting the rubber to grip.

The Pittsburgh Testing Laboratory, a private organization, which tested the product, declared that the new tread also increased tire wear 19.1 per cent. The new tread, with a flatter contour than usual, is a series of wave-like spirals so arranged that they form channels out of which water drains in the gripping action of the tire on wet pavements.

. . . slants

WORKER WELFARE—*Following a six-months' preliminary study, the National Association of Manufacturers has named a committee, headed by Frank Purnell, president of the Youngstown Sheet & Tube Co., Youngstown, Ohio, to promote further industrial adoption of the highest possible working condition standards and providing for initial studies*

covering plant medical services, sanitation, heating, lighting, ventilation, and safety. Industrial experience and procedure in applying minimum standards recommended by the American College of Surgeons, the Bureau of Standards, the National Safety Council, and others will be studied with a view toward improvement and expansion.

UP 25 PER CENT—*An increase of approximately* 25 *per cent in total number of airplanes manufactured in the United States in* 1937 *is shown in aircraft production figures for the year released by the Bureau of Air Commerce, Department of Commerce.*

The total of all aircraft produced was 3773 *in* 1937, *while in* 1936 *the total was* 3010. *Greatest increase occurred in the number of two-place cabin land monoplanes. In* 1936 *there were* 938 *manufactured while* 1502 *were constructed in* 1937, *or approximately* 66 *per cent of the total manufactured for domestic civil use.*

Of the 1937 *production,* 2289 *aircraft were for domestic civil use,* 858 *were for delivery to military establishments, and* 626 *were exported.*

Production

(*Continued from page* 371)

Buick went to four days a week with daily output expected to average 800 cars for a projected March output of 16,000 units as against 11,600 for February. Pontiac has added a day to its schedules as have all of the Chrysler units. In some instances the increase in hours of production has not meant a directly proportionate increase in output because the change has involved rearrangement of working schedules to give employes with seniority more production time.

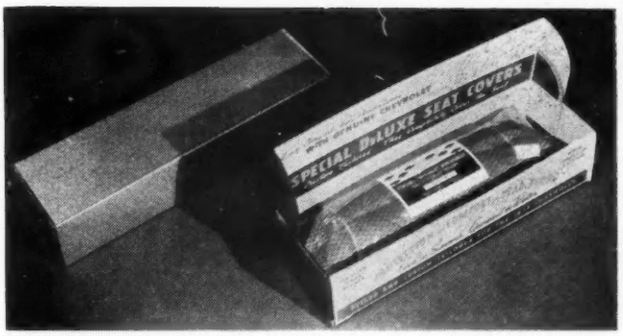
Production this week will show an increase of approximately 3500 cars and trucks over last week, accounted for largely by General Motors and Chrysler divisions. This increase should establish the week's output in the neighborhood of 55,000 units.

Dodge sales of cars and trucks for the week ending March 5 were up 5.8 per cent over the previous week and 12.5 per cent better than during the first week in February. Dodge dealers sold 9707 used cars in the week ended March 5 and 9356 in the week ended Feb. 27.

—J. A. L.

PRIZE PACKAGE

This shipping container won for Chevrolet Motor Division of General Motors Sales Corp., Detroit, an award in the 1937 All-America Package Competition, sponsored by **Modern Packaging.**



Japanese Diesel Car Program Lags

Entry of Ten New Companies Into the Field Last Year Has Little Effect in Boosting Total Production

Despite the fact that about 10 Japanese companies last year began building Diesel powered automobiles, there has been very little increase in Diesel car production. Influential firms such as Hitachi, Ltd., Mitsubishi Heavy Industries, and Ikegai Automobile are apparently unable to create quantity demand in civilian circles. Furthermore, these factories are at present very much occupied with "special orders" in connection with the Sino-Japanese war.

When the conflict ends, however, they naturally will divert most of their manufacturing facilities to meeting private demand. Many projects are scheduled for completion next winter. They include additional work on the Mitsubishi factory at Maruko, Ikegai's Kawasaki plant, Hitachi's Kameido works and the Kamata high-speed Diesel engine shop of the Niigata Iron Works.

As Diesel automobiles cost too much now in comparison with gasoline cars, curtailment of production cost is considered a prerequisite for promoting private buying of Diesel cars. It is also being urged that the government extend its aid in the form of exemption from or reduction of tax on Diesel oil or Deisel automobiles.

Expansion

The Kyobo plant of the Toyota Automotive Industrial Co., now being constructed on a 2,000,000 sq. yd. site at Kamogori, Aichi Prefecture, is scheduled for operation next May. The new plant will employ 12,000. Increase in capitalization from the present 12,000,000 yen to 30,000,000 yen is planned by this company.

The Osaka Kikai Seisakusho also plans to raise its capitalization from 8,000,000 yen to 20,000,000 yen. The increased funds will be used, partly, to finance production of a small car.

Within this year, the Nissan Jidosha Kaisha's capitalization may be raised to 40,000,000 yen through its new parent firm, the Hitachi Works, Ltd. Nissan is aiming for a monthly production of 40,000 cars.

Bids are being received on machinery worth almost 500,000 yen for the proposed Showa Automobile Industry Co. The new firm will have a fully-paid capital of 1,000,000 yen and is to specialize in the manufacture of a complete parts line.

GM February Sales to Dealers Pass 1937 Figure by 27.7%

February sales of General Motors cars to dealers in the United States and Canada, together with shipments overseas, totaled 94,449, an increase of approximately 27.7 per cent as compared with 74,567 in February a year ago. Sales in January were 94,267. For the first two months of 1938 sales totaled 188,716, an increase of roughly 6 per cent as compared with 178,235 for the same two months of 1937.

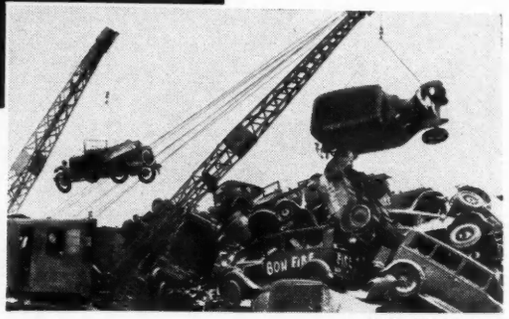
To consumers in the United States, sales of General Motors cars totaled 62,831 in February, topping the figure of 51,600 for February a year ago. Sales in January were 63,069. Sales for the first two months decreased about 13 per cent with a total of 125,900 for 1938 as compared with 144,598 for the same two months of 1937.

Sales of General Motors cars to dealers in the United States totaled 63,771 in February, an increase of 14,097 units over the total in February a year ago. Sales in January were 56,938. Sales for the first two months of 1938 totaled 120,709, slightly more than the 120,575 registered for the same two months of 1937.

From East, West North and South

Dealer Impressions of the Industry's $1,250,000 Used Car Campaign

Phila. Evening Public Ledger photo



Wide World photo

FINIS Giant "junker" bonfires, used car parades, and other demonstrations ushered in National Used Car Exchange Week across the United States on March 5. Pictured here is a pile of 150 obsolete cars burned to destruction in Philadelphia.

Automotive Industries' Correspondents Report on Mid-week Sampling of the Effects of "National Used Car Exchange Week"

A mid-week sampling of dealer reaction to the effects of the automobile industry's $1,250,000 "National Used Car Exchange Week" made by AUTOMOTIVE INDUSTRIES' correspondents throughout the nation brought a gamut of opinions ranging from deep disappointment to high enthusiasm. Too early to provide facts and figures, the survey did reveal a prevailing dealer sentiment that the industry's campaign greatly increased the number of "lookers" and, generally, aided in the reduction of inventories.

DETROIT

"Used car sales up sharply," according to H. H. Shuart, manager of the Detroit Automobile Dealer Association.

"With more than half the precincts still to be heard from," Shuart reported, "dealers are reporting sales approximately 100 per cent ahead of this period a year ago. Specifically, the dealers we have heard from have sold slightly over 700 used cars—most of them trades for older models."

Individual dealers also reported success in varying degrees, sentiment being unanimous that the campaign greatly increased the number of lookers and that the majority of them were bargain hunters particularly interested in late models such as '36 and '37 models.

NEW YORK

With few exceptions, automobile dealers in Greater New York were unable to determine by mid-week whether National Used Car Exchange Week was going to result in increased used and new car sales or not. Of the dealers interviewed, three reported slight declines; three reported slight increases in sales, and one reported marked increase in the number of prospects and a gain of about 15 per cent both in used and new car unit sales, representing about 15 per cent increase in dollar volume.

WASHINGTON

Seven representative dealers were covered. Only three reported that the campaign had been extremely beneficial and of those three, one dealer said it was impossible to separate the sales resulting from the campaign from those resulting from a normal seasonal increase.

Up to closing time on Wednesday, close to 100 used cars had been reported sold by the seven dealers, although none would venture opinion as to what the figure would have been without the campaign. Most of the dealers reported a slight increase in sales over last week although doubt was expressed in some instances that the increase was due in full to the manufacturer-sponsored used car program.

KANSAS CITY

More thousands of used car prospects were contacted during the first half of the week than probably in any other like period in Kansas City. Sales figures were not compiled by the Motor Car Dealers Association, but estimates indicated a 50 per cent increase over a year ago.

Opinion was divided among dealers in their reaction to the program, several of the larger distributors expressing the belief that the national advertising and radio "commercials" had left a false impression with prospects that used car prices were to be reduced to "gift" figures.

WINONA, MINN.

Enthusiasm ran high in Winona. Of six dealers questioned, all urged that the campaign be repeated in 1939; one dealer suggesting that such a campaign be held at least four times a year. One dealer said, "Our company sold 16 used cars during the first four days of the campaign. About 700 prospects were created by the campaign. Average sale price was $400; average age two to four years. The campaign did not seem to benefit new car sales."

Another cryptically commented, "Campaign disappointment. Public suspicious. Inventory appreciably reduced. About 30 prospects contacted. Sold five cars; no trade-ins. No benefit to new car sales."

SOUTH BEND, IND.

Dealers were reported as gratified by the surge in sales and prospects since the campaign started on Saturday last week.

BOSTON

Distributors were reported united on agreeing that the used car week would break the log jam holding up business. Inventory and dollar volume both have gone down. One company set its objective at $10,000 volume for the week. It had passed $12,000 before Wednesday with $6,000 clear. Others reported the good medium priced cars in demand, leaving them with the larger models and some small very cheap ones.

Fred Ordway, president of the Boston Automobile Dealers Asso-

ciation, who served as chairman of the general committee, stated that dealers reporting to him said stocks were reduced about 25 per cent and dollar value inventory was down 30 per cent.

WILMINGTON, DEL.

Six leading dealers in this area reported the following in almost identical terms: 1. Tremendous spurt in sale of used cars attributed directly to national campaign; 2. Praise for the promotion as intelligent, timely, and worthwhile; 3. Definite reduction in inventory; 4. Total of 500 prospects interviewed; 5. Promotion did not result in sale of new cars and only to small extent in trade-in on new cars; 6. Sale of used cars 60 to 80 per cent better than that of the two preceding weeks; 7. Sales of used cars approximately 100 per cent above last year.

BALTIMORE, MD.

A number of dealers agreed that there was considerable business done in used cars and that they were enabled to reduce their inventories, but some declared that the public got the impression that the dealers were overloaded with used cars and were forced to move them. As a result, they said, buyers in a number of cases got the idea that they could pick up good used cars at prices far below their actual value.

Speaking privately, some men in the trade expressed the opinion that the drive was far from expectations, one declaring that it had forced down used car prices and failed to aid new car sales. He also expressed the opinion that the campaign was conducted at the wrong time, pointing out that March usually is a fair month for the sale of used cars.

AKRON

Akron automobile dealers who beat the gun on National Used Car Week by running their own cooperative program in advance of the national campaign and by staging a two-day used car mardi gras on March 3 and 4, reported used car sales for the past week averaging 40 per cent better than for the preceding ten days and nearly 100 per cent higher than during January. In contrast to average sales of 26.5 used cars per day during January, dealers for the first nine days of March show an average of 48.5 used car sales per day.

Nearly half of used car sales stimulated by the cooperative effort have been "clean" sales to entirely new buyers who have never before owned cars. The balance of sales have been trade-ins with motorists invariably trading in their cars for higher priced and later model cars.

A canvass of leading Akron dealers indicates that a majority have benefited materially and have substantially increased their used car sales, but have seen little reflection, as yet, of the new car market. They expect the broad benefits of the used car week to last for some time, claiming that the cooperative advertising has made motorists car-conscious. Only one major Akron dealer appears opposed to the campaign, arguing that it has made motorists price-conscious and has encouraged price cutting of an unwarranted nature.

Ford Sales Soar First Campaign Day

One of the largest single day's sales of used cars in the 35-year history of the Ford Motor Company were made by Ford dealers Saturday on the opening day of National Used Car Exchange Week.

"Sales Saturday were three times as great as the daily average for the preceding 10-day period," said John R. Davis, general sales manager of the company. "Ford dealers sold 10,000 used cars against 3400 average daily sales for the last 10 days in February.

"Gross sales in used cars were $2,500,000 for Saturday, compared with $788,000 daily average for preceding days. Still more important, dealers report a total net reduction in used car inventory of $1,450,000 showing that an exceptionally high proportion of the sales made in the first day of the nation-wide drive involved no trade-in."

Mr. Davis said that approximately 40 out of every 100 of the sales were made without acecpting other cars in trade.

ALLENTOWN

The industry's campaign was credited generally for appreciable increases in the activity in dealer show rooms, with many more prospects appearing than in preceding weeks. Several of the dealers had ideas for what they regarded as a more profitable manner in which to expend $1,250,000. Said one, "My frank opinion is that the several million dollars spent for the entire program could have been used more effectively in cooperating with the salesmen." Another said that he believed the money spent on the campaign could have been used with greater profit to scrap at least a half million cars. Still another expressed a similar opinion that a more effective way to spur used car sales would be to develop a cooperative program to retire old and obsolete cars and destroy them.

AUSTIN, TEXAS

Most local automobile dealers expressed themselves as well pleased with the increased sales of used cars and in trade-ins for new cars this week. President of one dealership expressed the view, "While the num-

(Turn to page 381, please)

Phila. Evening Public Ledger photo

FOR SALE—

Part of Philadelphia's parade of used cars staged on the opening day of "National Used Car Exchange Week." Detroit, Chicago and other cities also inaugurated the campaign with used car parades.

Business in Brief

Written by the Guaranty Trust Co., New York

There was no pronounced change in developments in general business last week. The index compiled by the *Journal of Commerce*, for the week ended Feb. 26 resumed its downward trend after two successive advances, standing at 68.2, as compared with 69.6 the week before and 102.1 a year ago. Retail sales ranged from 1 to 3 per cent above those in the preceding week, although the level was from 5 to 11 per cent below that a year ago. Easter preparations are apparent in wholesale markets, although the volume of orders received thus far is from 7 to 18 per cent below that in the corresponding period last year.

Railway freight loadings during the week ended Feb. 26 totaled 511,930 cars, which marks a decline of 23,860 cars below those in the preceding week, a decrease of 180,463 cars below those a year ago, and a drop of 160,939 cars below those two years ago.

Production of electricity by the electric light and power industry in the United States during the week ended Feb. 26 was 8.0 per cent below that in the corresponding period last year.

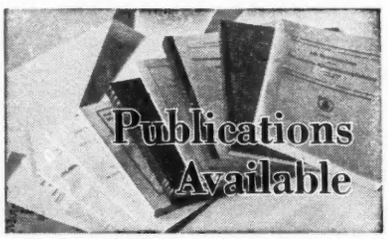
Lumber production during the week ended Feb. 19 stood at 41 per cent of the 1929 weekly average. The levels of output and shipments were approximately the same as those in the preceding week, while new business showed a slight gain.

There were sharp declines in factory employment and payrolls during January, according to a statement issued by the Secretary of Labor. It is estimated that the decline in the number of non-agricultural workers during the month ended Jan. 15 totals 1,300,000. Since last October the drop amounts to 2,800,000.

Average daily crude oil production for the week ended Feb. 26 amounted to 3,322,800 barrels, as compared with 3,369,250 barrels the week before and 3,296,100 barrels a year ago.

Professor Fisher's index of wholesale commodity prices for the week ended March 5 stood at 83.0, the same as the week before, as compared with 82.4 two weeks before.

The consolidated statement of the Federal Reserve banks for the week ended March 2 showed no changes in holdings of discounted bills, bills bought in the open market, and Government securities. Money in circulation increased $19,000,000, and the monetary gold stock declined $17,000,000.



The Carlyle Johnson Machine Co., Manchester, Conn., has brought out its 1938 clutch catalog describing its Johnson **friction clutches.***

Latest publication issued by the Fellows Gear Shaper Co., Springfield, Vt., describes the **"face gear"** and its applications.*

Beryllium copper safety tools are described in a pamphlet recently released by The Beryllium Corp. of Pennsylvania.*

General Motors Corp. has issued a brochure entitled "Procedure Covering Administration of the General Motors **Dealer Relations Board."***

Three bulletins issued by the Oilgear Co., Milwaukee, Wis., Nos. 32,100, 32,200 and 33,101, describe in detail the company's new **gooseneck, straightening, and sideplate presses.***

A new **used car manual** has been prepared by the Pontiac Motors division of General Motors Corp.*

The Customer Research Staff of General Motors Corp. is distributing its **automobile style ballot** which is designed to get public reaction to style trends of the 1938 models.*

National Highway Users Conference, Washington, D. C., has published the final 1937 laws bulletin which is a **digest of new legislation affecting highway users.***

Considerable information on **pre-finished metals** has been compiled into booklet form by the American Nickeloid Co., Peru, Ill.*

Herman H. Sticht & Co., New York City, has issued bulletin No. 715 which describes its Standco **speed indicator.***

The Rockford Drilling Machine Division of Borg-Warner Corp., Rockford, Ill., has brought out a pamphlet containing illustrations, diagrams, and brief descriptions of its line of **over-center clutches** including the roller cam feature.*

"The Dollars and Sense of **Modern Cleaning for Industry"** is the title of a pamphlet recently issued by The Invincible Vacuum Cleaner Mfg. Co., Dover, Ohio.*

Bulletin No. 437 just published by the Lake Erie Engineering Corp., Buffalo, N. Y., contains descriptive material on the Lake Erie Morgan **cupola chargers.***

*Obtainable from editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia.

February Shipments at 205,100

February factory shipments of American passenger cars and trucks totaled 205,100 according to a preliminary estimate made by the Automobile Manufacturers Association.

On the basis of this estimate, the industry's operations for the month were 10 per cent under January and 47 per cent under February, 1937.

Shipments for the first two months of 1938 are estimated by the Association at 433,174 units, a decrease of 45 per cent in comparison with the corresponding period last year.

Installment Trends

Survey of New and Used Car Terms Compares December 1936-1937

Trends of installment terms for new and used automobiles, comparing December, 1936-1937, are summarized and supported by factual data in the recently published report of a study prepared by Malcolm L. Merriam, chief, Installment Credit Unit, Marketing Research Division, Bureau of Foreign and Domestic Commerce. To obtain information for the investigation, the Department of Commerce enlisted the cooperation of the membership of the Associated Credit Bureaus of America. Credit bureaus in 240 cities throughout the United States were asked to report on prevailing local conditions with reference to minimum down payments and maximum monthly terms.

With regard to new automobiles the report found that conditions prevailing in the cities surveyed indicated a definite shift from minimum down payments of less than 30 per cent, particularly 25 per cent, in December, 1936, to the 33 1/3 per cent classification which included 79 per cent of the reporting cities in December, 1937. Maximum terms were also restricted from 36 months in a few cases, but particularly 24 months, to 18 months. Fifteen per cent of the reporting cities indicated prevailing terms of 18 months in 1936 and 46 per cent in 1937.

The largest number of cities, 48 per cent in 1936 and 54 per cent in 1937, indicated 33 1/3 per cent as the prevailing minimum down payment on used cars. Eleven cities reported more than 33 1/3 per cent down payment in 1936 and 20 cities, or 24 per cent of the total, in 1937. There was a marked contraction of terms from the 18 months and 24 months classifications to the 12 months and 12 to 18 months classifications which accounted for 24 per cent of the total number of cities in 1936 and 52 per cent in 1937. Terms of 18 months and over were still common to 40 per cent of the reporting cities in 1937.

Tables giving results of the survey of minimum down payments and maximum terms reported for new and used automobiles by 82 cities are appended herewith.

Minimum Down Payments Reported for New Automobiles in 82 Cities December, 1936-1937

1936 Cities		Minimum Down Payment (Per cent)	1937 Cities	
%	No.		No.	%
2.4	2	10	2	2.4
2.4	2	15	2	2.4
2.4	2	20	0	0.0
25.6	21	25	8	9.8
4.9	4	25-33-1/3	2	2.4
3.7	3	30	2	2.4
57.3	47	33-1/3	65	79.3
1.2	1	40	2	2.4
	82		82	

Maximum Terms Reported for New Automobiles in 82 Cities December, 1936-1937

1936 Cities		Maximum Terms (Months)	1937 Cities	
%	No.		No.	%
1.2	1	Unclassified	1	1.2
1.2	1	12	1	1.2
3.7	3	12-18	6	7.3
1.2	1	12-24	0	0.0
1.2	1	12-30	0	0.0
1.2	1	15-18	1	1.2
1.2	1	16	1	1.2
14.6	12	18	38	46.3
6.1	5	18-24	12	14.6
2.4	2	20	3	3.7
50.0	41	24	17	20.7
2.4	2	24-30	0	0.0
9.8	8	30	2	2.4
3.7	3	36	0	0.0
	82		82	

Minimum Down Payments Reported for Used Automobiles in 82 Cities December, 1936-1937

1936 Cities		Minimum Down Payment (Per cent)	1937 Cities	
%	No.		No.	%
3.7	3	Unclassified	0	0.0
1.2	1	5-10	1	1.2
2.4	2	15	0	0.0
7.3	6	20	3	3.7
0.0	0	20-25	2	2.4
12.2	10	25	4	4.9
3.7	3	25-33-1/3	2	2.4
1.2	1	25-40	0	0.0
4.9	4	30	4	4.9
2.4	2	30-40	2	2.4
47.6	39	33-1/3	44	53.7
3.7	5	33-1/3-40	4	4.9
9.8	8	40	16	19.5
	82		82	

Maximum Terms Reported for Used Automobiles in 82 Cities December, 1936-1937

1936 Cities		Maximum Terms (Months)	1937 Cities	
%	No.		No.	%
3.7	3	Unclassified	2	2.4
1.2	1	6	1	1.2
1.2	1	6-18	1	1.2
0.0	0	9	1	1.2
1.2	1	9-12	0	0.0
1.2	1	10	1	1.2
14.6	12	12	23	28.0
9.8	8	12-18	20	24.4
1.2	1	12-30	0	0.0
46.3	38	18	28	34.1
4.9	4	18-24	1	1.2
12.2	10	24	4	4.9
1.2	1	30	0	0.0
1.2	1	36	0	0.0
	82		82	

Perfect Circle Declares Dividend

The regular quarterly cash dividend of 50 cents per share on 162,000 shares of common stock outstanding has been declared by the board of directors of the Perfect Circle Co., Hagerstown, Ind.

URWU Gets Goodrich Ultimatum

Company's Six-Point Proposal Emphasizes Necessity for Labor Harmony or Transfer of 5000 Jobs from Akron to Subsidiary Plants

Unless union wages can be cut from 10 to 20 cents an hour, with absolute harmony produced, plus assurances of uninterrupted plant operations, the B. F. Goodrich Co. will transfer 5000 jobs out of Akron to its subsidiary plants, T. G. Graham, vice-president, this week officially informed the United Rubber Workers. Akron in the past two years, through decentralization as conduced by labor strife generated by the CIO, already has lost more than 15,000 rubber jobs, and "you are in position to determine whether 5000 more jobs must go to other communities," Graham said. Goodrich, he continued, paid Akron labor $19,361,927.57 in 1937, and Akron cannot afford to lose any part of this payroll.

Wages for male workers must be cut from present averages of $1.10 to $1.15 per hour to an average of 90 to 95 cents per hour, and for female workers from present levels of 70 to 75 cents an hour, down to an average of 60 to 65 cents, he warned.

The 6-point proposal of the B. F. Goodrich Co., as submitted to the United Rubber Workers Union, by Mr. Graham included the following:

"1—Assurances that will justify the Goodrich Company appropriating several million dollars for modernization and expansion in Akron during the year 1938.

"2—Assurances that the equipment and facilities now in service as well as the equipment and facilities to be installed will be operated efficiently and that our employes will cooperate with management in finding ways and means of improving processes and further reducing costs.

"3—Adjust labor rates as follows:

"Male workers from present average of $1.10 to $1.15 per hour to an average of 90 to 95 cents per hour.

Females from present average of 70 to 75 cents per hour to an average of 60 to 65 cents per hour.

"4—Otherwise, the company must reduce Akron tire production from two-thirds to one-third of total; that is, a reduction below the present level of 50 per cent; mechanical goods production from 85 per cent to 40 per cent of its total; that is, a little more than 50 per cent reduction.

"Such changes will only make us competitive with our two major Akron manufacturers who have decentralized their operations during the past two years. Neither of these companies now makes more than one-third of its tires in Akron. One makes no mechanical goods in Akron and the other makes only heavy mechanical goods in Akron.

"5—To carry out such a program will represent an investment by Goodrich of approximately $3,000 per job for each job provided in plants located outside of Akron, but without such a program our major competitors have an advantage of millions of dollars in cost as compared with our present Akron costs.

"6—Further decentralization by Goodrich will mean the loss of an-

(Turn to page 381, please)

Labor

(Continued from page 371)

expected to furnish a line on the strength of the opposition to the Martin program at the next convention of the union. UAW headquarters insist that the issues in most of the elections are concerned with details in the administration of the individual locals rather than expressions regarding the policies followed by the international union as a whole.

The "progressive" or Martin forces scored victories in Flint local 156 and in the DeSoto local last week and also elected their slate in the Packard local. The "unity" or anti-Martin forces offset these losses with claimed victories in a number of other important locals including: Murray Body, Detroit; Seaman Body, Milwaukee; Studebaker and Bendix, South Bend; Atlanta, Ga.; Fisher Body, Cleveland, and Toledo number 12. The Martin upsets in South Bend, Milwaukee, and Atlanta are regarded as definite setbacks to the administration.

Although no further announcements have been made it is expected that negotiations for the renewal of the UAW contract with the Chrysler Corp. will begin on March 14 as scheduled several weeks ago. The contract expires on March 31. Representatives of the union and of General Motors continue to hold "informal" discussions from time to time but no specific action has yet been reported in connection with the UAW-GM agreement.

Automotive Metal Markets

Producers and Sellers Share Sentiment That Price Reductions Will Not Increase Buying Volume at Present Time

Sentiment in all of the metal market's divisions, non-ferrous as well as ferrous, is impressively alike in one respect, the belief on the part of producers and sellers that a more satisfying volume of buying cannot be built up at this time through price reductions. Even in the tin market, where apathy on the part of buyers has always been reflected in price declines that would whet the appetite of bargain-hunters, importers refrained from concessions this week, convinced that lower prices would hardly bring out more business and that they might as well ride out the dead calm without disturbing the price set-up. With slight variations, the attitude of copper producers and marketers and in the zinc and lead market is largely that of the tin sellers.

The subject of steel prices has come to be one for academic, rather than practical discussion, in so far as the immediate future is concerned. In covering their current steel needs, automotive consumers do no price shopping, placing their orders with those mills that have established a record for quality and prompt shipments. Were there any assurance that a reduction in steel prices would bring an immediate increase in steel buying by automobile manufacturers, it would undoubtedly come in for the most serious consideration of the steel industry, but watching the progress of the drive for the sale of used cars and other moves to quicken recovery in the automobile market just as closely and sympathetically as the automobile manufacturers, the steel producers do not believe they would be contributing anything worth while to recovery, if at this time they lowered prices, making their already low rate of operations still more unprofitable.

When betterment of conditions has reached the stage, at which momentum of demand can be accelerated and volume increased by price concessions, this question of steel prices will again become a practical one. Meanwhile, this week's rate of employed ingot capacity shows 2 per cent improvement over last week and steel company sales managers look for a marked increase in orders during the second half of the month. Formal opening next week by one of the large independents of another continuous mill for the production of wide strip shows that the long range view of steel producers as to the prospects of automotive consumption is decidedly optimistic.

From Singapore comes word that the drastic reduction in the tin export quota decreed by the International Tin Committee is bringing loud protests from the tin producers, who have been compelled to lay off 20,000 workers. The producers charge that the result of the Tin Committee's action will be to drive the price up, benefiting speculative holders, but neither producers nor consumers of tin.

Spot Straits was offered at the beginning of the week at 41¾ cents, without attracting any buyers. Later in the week the market made fractional gains.

Although London showed less enthusiasm for the higher copper market than when the political outlook seemed more critical, the export price was maintained at around 10 cents, which helped to steady the home market at that level.

With some progress in bringing output into line with sales, zinc producers had little difficulty in maintaining prices unchanged. Similar conditions were noted in the market for lead.

At the close of the markets on Tuesday, every one was wondering what effect the increased freight rates would have on the situation.

—W. C. H.

Reports from Automotive Russia

Soviet Plants Produced Nearly 200,000 Vehicles in 1937 To Capture First Place in Output in Europe

For the third year in succession, Soviet automobile plants hold first place in Europe, and second in the world after America, for the production of motor trucks. The Soviet automobile industry, which produced 1702 cars and trucks in 1929, completed the year 1937 with an output of 200,000 vehicles. Preliminary figures put production rise from 133,000 in 1936 to 182,000 last year. Output of passenger cars was almost five times that of the previous year, and was marked by large-scale production of model cars of the M-1 and ZIS-101 types.

The industry entered upon the new year with plants tuned for increased production. Plans are said to be well ahead for the expansion of factories and production of new models.

At the famous Molotov Plant in Gorky, it is hoped that the original annual output of 120,000 vehicles will be raised to 250,000 by the end of the year, and the plant's capacity increased fourfold by 1941. This plant is working on a new six-cylinder 76 hp. engine for the M-1 automobile designed to replace the present four-cylinder 40 hp. engine. This will give the model a speed of between 110 and 115 kilometers per hr. (68.5 and 71.5 m.p.h.) Improvement based on changes in the steering gear and the suspension of the engine will be made. Another development at this plant will be the production of a six-cylinder engine for use of 1.5 ton trucks, which will raise their capacity to two tons and make possible a speed of 75 km. per hr. (46.6 m.p.h.).

This year will see the completion —in the main—of the expansion that has been going on at the Stalin Automobile Plant in Moscow during the last two years. The enlarged plant, covering an area of 1000 acres, will be capable, when working at full capacity, of turning out 95,000 three-ton trucks and 16,000 passenger cars a year. At present the plant has an annual production of 70,000 trucks. New models and a number of improvements to present designs are to be introduced in the current year. Workers at this plant, which produces the ZIS-101 type automobile, are still faced with the problem of increasing production to the planned figure and of effecting smoother organization.

In the experimental shops of the Stalin Plant a new car—known as the ZIS-102—has been produced. Its features include a radio and heating installation. Production on a commercial scale will be organized this year. Other developments at the plant include the production of an eight-cylinder engine for the ZIS-5 trucks in place of a six-cylinder model, and the output of streamlined buses with a seating capacity of from 25 to 28. Designs are being worked out for large buses for inter-urban services, and for high-speed, long-distance trucks.

At the Yaroslavl Automobile Plant, an improved five-ton truck is being designed. An important develop-

ment here will be the increased production (from 192 in 1937, to 400 this year) of trolley buses, including a number of double-deck models, to meet the demand which is the result of the widespread introduction of this vehicle in city transport.

Throughout the automobile industry work is proceeding on the development of mass production of diesel engines suitable for motor transport. This year the Molotov and Stalin plants are to produce gas generators which use wood as a fuel, lorries thus equipped are proving particularly useful in lumber camps.

Another problem being tackled by the industry is that of designing high-speed automobiles. A special designing bureau has been established for the purpose, and is engaged in designing a fast passenger car which, under normal working conditions, will have a speed of between 200 and 250 km. per hr. (124.5 and 155.5 m.p.h.).

Goodrich Ultimatum

(*Continued from page* 379)

other 5000 jobs to Akron, and we estimate that Akron has probably already lost 15,000 rubber jobs since decentralization got under way two years ago. Where 40,000 rubber jobs existed in Akron two years ago, today only 25,000 rubber jobs exist. You are in a position to determine whether 5000 more jobs must go to other communities.

"In 1937, Goodrich paid to wage earners in Akron $19,361,927.57. Akron cannot afford to lose any part of this payroll, but it can only be maintained by keeping Goodrich competitive with companies outside of Akron."

URWA officials indicated that they would make an official reply to the Graham statement soon.

CaterpillarTractorAugmentsLine With New 66 Hp. Diesel Engine

The Caterpillar Tractor Co., Peoria, Ill., has announced a new, six-cylinder, 66 hp. industrial Diesel engine of four-stroke-cycle, valve in head, water cooled design, featuring solid injection of the fuel into precombustion chambers. The engine has a bore and stroke of 4¼ in. by 5½ in. and turns at 1400 r.p.m., normal governed speed.

A 14 hp., two-cylinder gasoline starting engine is mounted at the rear of the Diesel, directly over the flywheel housing. It has a governed speed of 3000 r.p.m. This engine cranks the Diesel through a pinion and clutch arrangement which automatically disengages when the larger engine fires.

The new engine will be known as the model D4600.

Used Car Drive

(*Continued from page* 377)

ber of immediate sales have been somewhat disappointing, the plan has increased interest and will result in the movement of a good many cars eventually. One drawback is that registration of cars starts next month and many persons prefer to wait until after that time."

TOLEDO, OHIO

Dealers in Toledo reported a very noticeable gain in inquiries, prospects and closed deals on used cars as a result of National Used Car Exchange Week. Typical dealer report was: "Reduced both car and dollar inventory. About 70 per cent of deals involve a trade-in. So far inventory has been cut 18 cars and about $3,500 for the three days. This volume is about the normal of a year ago and about twice what is was in recent weeks."

Some dealers found unfavorable reaction to new car sales due to bargain prices for used cars and low trade-in values.

MILWAUKEE

Individual dealers contacted were hesitant about answering specific questions but expressed belief that used car campaign would prove big success. The Milwaukee Dealers Association had started a big campaign Jan. 15 and entered the present campaign with used car inventories below normal and far below last year. National campaign was credited in some quarters for helping to bring about what little new car sales were made.

PHILADELPHIA

General reaction very favorable with one dealer expressing opinion that national campaign served to aid in closing sales with many prospects developed by his salesmen. All reported large increase in number of visitors to lots and showrooms with appreciable increase in number of prospects. Another dealer hailed the campaign week as the best he had experienced this month. The same dealer reported his used car sales for the current month to date totaling 50 as compared to 116 for the full month last year. It was generally agreed that the campaign was having no effect on new car sales.

Calendar of Coming Events

Conventions and Meetings

SAE National Passenger Car Meeting, Detroit, March 28-30, 1938

SAE National Tractor Meeting, Milwaukee, Wis..April 14-15,1938

Chamber of Commerce Meeting, Washington .....May 2 to 5, 1938

American Foundrymen's Association, Foundry Show, Cleveland .....May 14-19, 1938

SAE Summer Meeting, White Sulphur Springs, W. Va. June 12-17

Books

of automotive interest

MANNSCHAFT UND MEISTERSCHAFT — EINE BILANZ DER GRAND-PRIX FORMEL 1934-37 *(Team and Championship — A Critique of the Grand-Prix Racing Rules 1934-7.), by Hans Bretz. Published by Daimler-Benz A. G., Stuttgart, Germany.*

Bretz's book of slightly more than 100 pages is a record of international racing during the four years the late Grand-Prix formula, (which has now been superseded by a new one) was in force. It is naturally written from the point of view of the Mercedes-Benz Co. The most interesting feature of the book is the numerous excellent reproductions of views from leading international races of the period covered, the Grand-Prize races of Germany, Italy, Switzerland, Belgium, Monaco, France and Spain.

February Rim Inspections Total 477,600

The monthly report of the Tire and Rim Association indicates a total of 477,600 rims inspected and approved for February, 1938. The total for the same month last year was 2,022,258.

The first two months of 1938 as compared with the first two months of 1937 show a decrease of approximately 76 per cent in the number of rims inspected and approved.

Shell Broadens Its Research in

By JOSEPH GESCHELIN

IN accord with the need for basic information concerning engine fuels and lubricants as well as their most efficient utilization in production engines, the Shell Petroleum Corp., Wood River, Ill., embarked this year on an ambitious program aiming at expansion of its facilities for research.

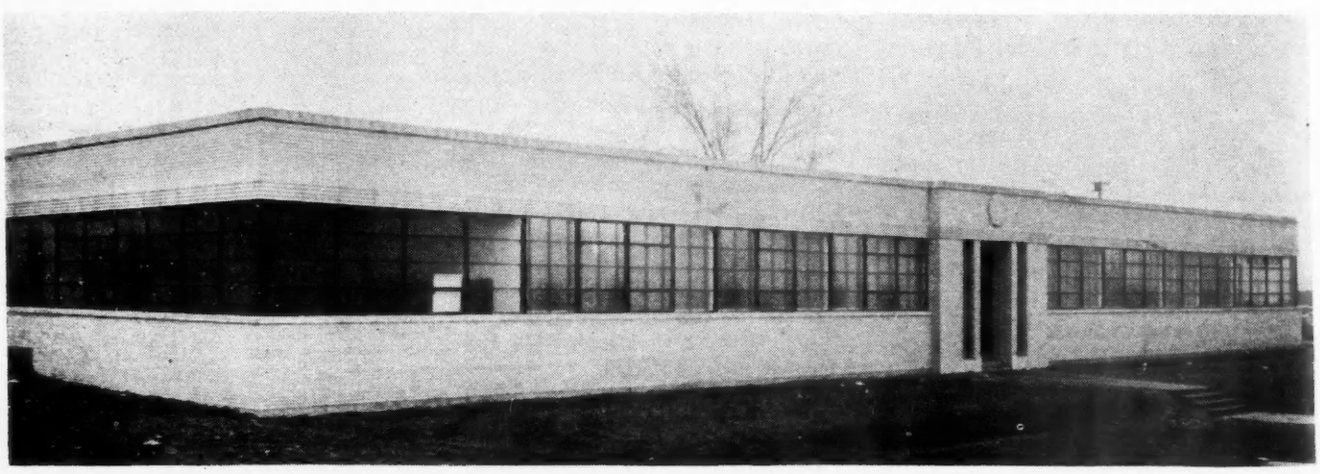
This has been reflected tangibly in the erection of a new research laboratory plant adjacent to the Wood River Refinery. The building is in the form of a hollow quadrangle with unequal legs and an open end in the rear. It has a frontal section about 162 ft. in length, a north wing some 146 ft. deep, and a south wing about 117 ft. deep. In capacity it will encompass all of the present facilities, augmented by a sizable expenditure in new equipment of various kinds. That defines the present program. The organization has anticipated the need for future expansion—which may be handled readily by enlarging the side wings of the building to any desired extent.

In addition to the Wood River engine research laboratory, Shell has a similar laboratory at Martinez, Calif., under the direction of A. G. Marshall. It is also provided with a number of single- and multi-cylinder gasoline and Diesel engines of various types, coupled to dynamometers for the purpose of studying the performance of fuels and lubricants under controlled conditions. A dynamometer for testing cars or trucks is also available, together with apparatus for testing transmission and gear oils; also for studying the application of greases in various types of service.

The Wood River laboratories are representative of the whole Shell automotive research scheme. Refer-

One of the chemical research laboratories

Exterior view front section of new Shell laboratory at Wood River



New Laboratories

ring to the floor plan giving the general layout of the plant shown on page 384: the principal activities in this laboratory are centered about engine research and are divided into mechanical or engine laboratories and the chemical laboratories. The right-hand, or south wing, houses the chemical laboratories; the left-hand, or north wing, is occupied by the engine research. The central block is occupied by the various administrative offices.

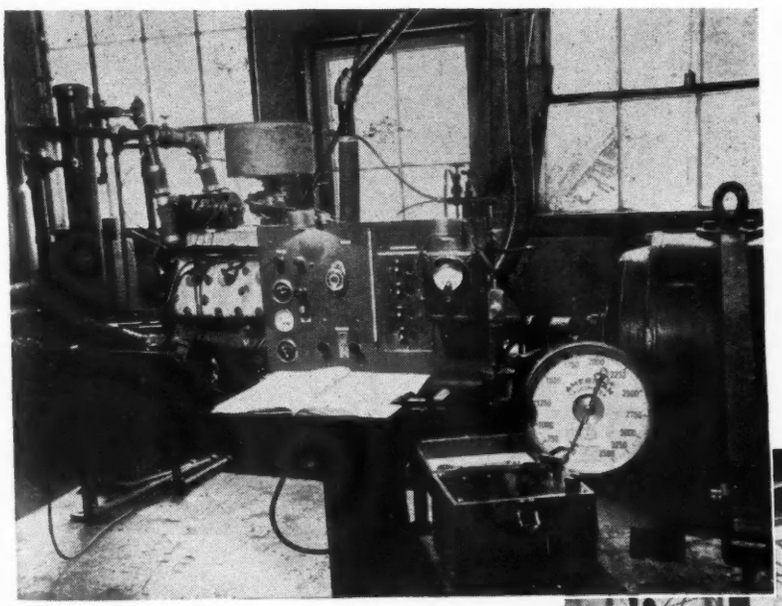
Close-up views of the stands are reproduced herewith and Table 1 gives a complete inventory of the major items of equipment now installed. This list does not show the comprehensive chassis dynamometer set-up which, for the present at least, remains in the old laboratory building. A brief but complete description of the chassis dynamometer will be given later in this article.

Although the laboratory is on refinery property, it is concerned only with research and is not used for any of the refinery inspection testing or problems. The refinery control laboratory is a separate organization with its own facilities on the refinery grounds and operates under the refinery head. The control laboratory operates, among other things, two pilot plants which are under the jurisdiction of the Chemical Research Department. These plants are used in the development of new processes as well as improvement in existing processes. One is used for continuous extraction; the other for continuous vapor phase gasoline treatment as well as special treatment of lubricating oils.

Confining our study to engine testing, we find that the laboratory carries on a continuous program of testing gasoline, oils and lubricants, Diesel fuels, and aircraft fuels and lubricants. These studies are made usually on test engines and production engines. There is no routine testing of samples.

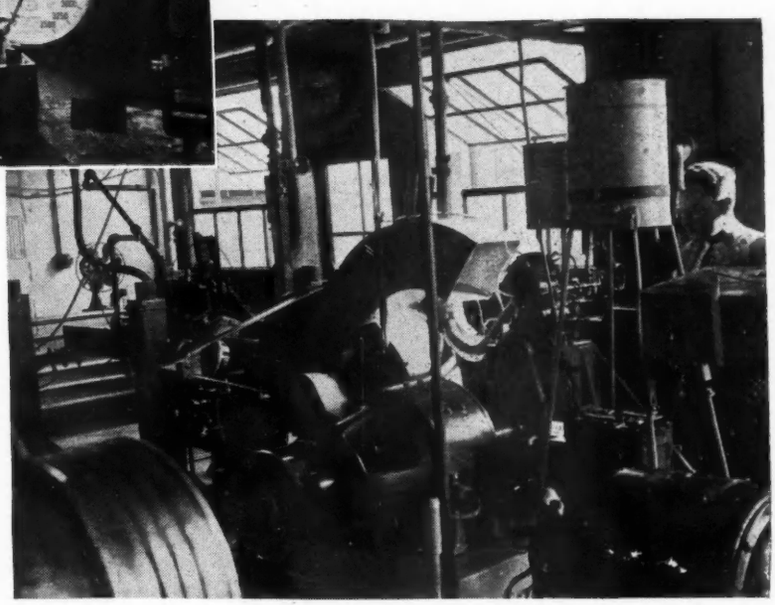
The engine testing program has fairly clear-cut objectives. In the first place, it is concerned with the standardization of knock rating methods for all Shell laboratories. Another of its major activities is the study of new developments in engine design so as to anticipate changing requirements for fuels and lubricants. How important this is, may be gaged from the fact that a major refinery change involves millions of dollars for new equipment and cannot be accomplished in less than about two years.

Trouble-shooting, a definite part of the set-up, is carried on in cooperation with fleet operators, engine builders, car manufacturers, and others. Most recent of the problems



(Left) Ford V-8 engine on test in universal dynamometer cradle

(Below) Single-cylinder Harley-Davidson motor cycle engine (foreground) and Ford four-cylinder engine (rear)

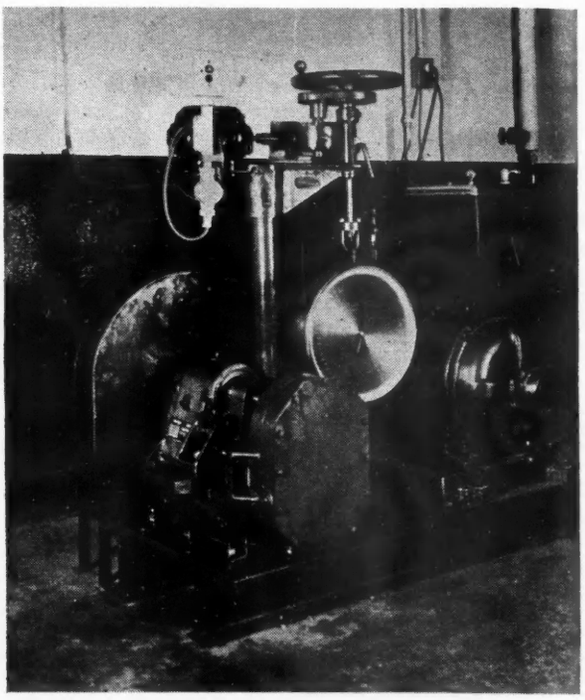


uncovered by this activity has been a mild epidemic of valve-sticking and troubles due to manifold deposits. As new problems of this kind are encountered, the laboratory gets down to the business of isolating the cause and discovering the remedy, although the process is neither so sure nor so simple as this statement would indicate.

Due to the difficulties attending the road-testing of passenger cars and trucks, the Wood River laboratory designed and built a special chassis dynamometer which is used to simulate, so far as feasible, actual road conditions. Quoting from a laboratory report on the subject: "In carrying out automotive road tests on petroleum products certain limitations and inaccuracies arise which cannot be overcome by even the most careful and exacting investigators. Constant speed tests on gasolines, engine oils, and gear lubricants cannot be run for any length of time because of intervening towns, occasional traffic jams, and state speed laws. Variable factors such as atmospheric temperature and wind resistance cannot be controlled or duplicated for check tests and comparative data. To overcome such difficulties it was decided to install a chassis dynamometer with the necessary equipment for accurately controlling the temperature within the range from —20 deg. Fahr. to 100 deg. Fahr."

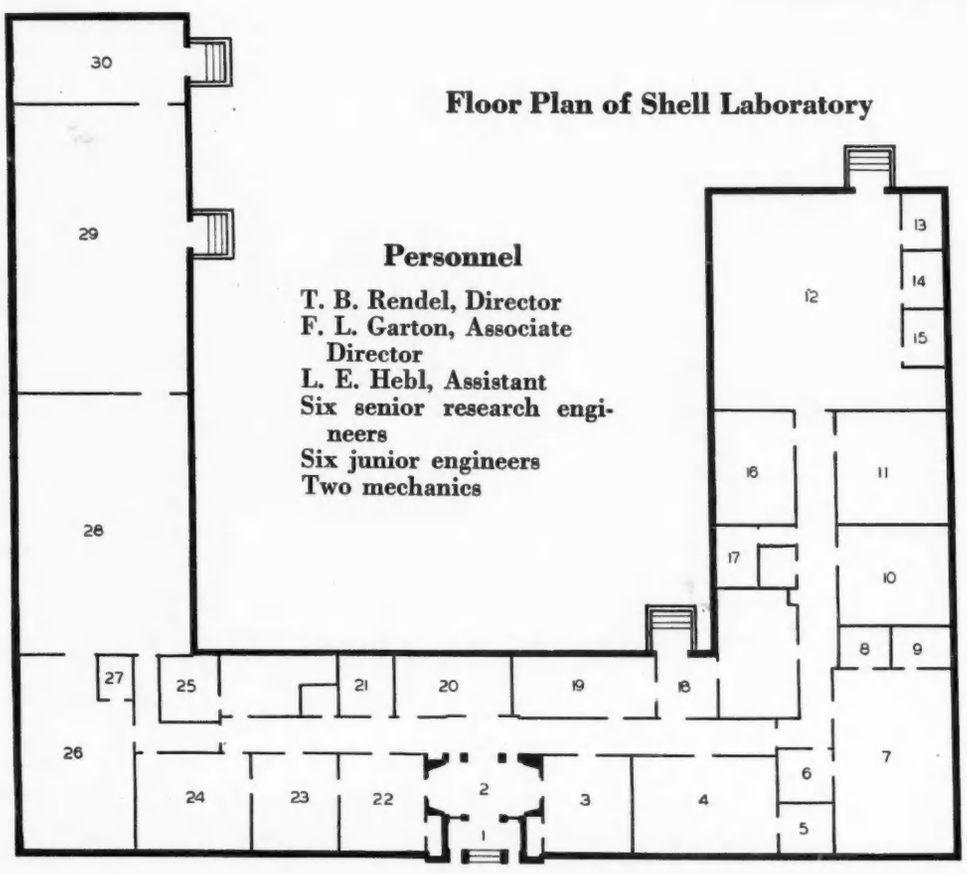
From the beginning, the chassis dynamometer was found to be a valuable instrument in conducting tests of new model passenger cars in the cooperative American Petroleum Institute program. In addition, the cold-room equipment is available for use in cooperative testing for fleet operators, engine builders, and individual car manufacturers.

The chassis dynamometer consists



View of one of the SAE extreme pressure lubricant testing machines

Floor Plan of Shell Laboratory



Personnel

T. B. Rendel, Director
F. L. Garton, Associate Director
L. E. Hebl, Assistant
Six senior research engineers
Six junior engineers
Two mechanics

1—Loggia
2—Lobby
3—Administration Office
4—Library
5—Discussion Room
6—Balance Room
7—Analytical Laboratory
8—Oxidizing Room
9—Viscosimeter Room
10, 11—Research Laboratories
12—General Laboratory
13, 14, 15—Research Offices
16—Physical Laboratory
17—Dark Room
18—Receiving Room
19—Technicians' Room
20—Stenographic Office
21—Office
22—Administration Office
23, 24—Research Offices
25—Men's Shower and Locker Room
26—Repair Room
27—Store Room
28—Small Motors' Room
29—Large Motors' Room
30—Aero Motor Room

List of Equipment

6 C.F.R. experimental engines for miscellaneous fuel and lubricating oil work. Includes one standard ASTM C.F.R. engine for standardizing other ASTM engines in the Shell group and one standard ASTM C.F.R. engine for miscellaneous octane number testing.

2 Test beds and dynamometers for automotive gasoline engines fitted with necessary instrument panels and other miscellaneous equipment used. At present a Ford V-8 and a 1935 Pontiac Six occupy these test stands for miscellaneous gasoline and lubricating oil work.

2 Commercial Diesel engines coupled to dynamometers. One of these, a Fairbanks-Morse single cylinder 4¼ in. by 6 in. engine, used mainly for experiments on piston ring sticking and fuel development work, is fitted very completely for temperature measurement including a special device for continuously measuring the actual piston ring temperature by means of thermocouples. The installation of a second Diesel is not yet planned in detail but is expected to be made early next year.

1 S.A.E. extreme pressure lubricating oil testing machine.

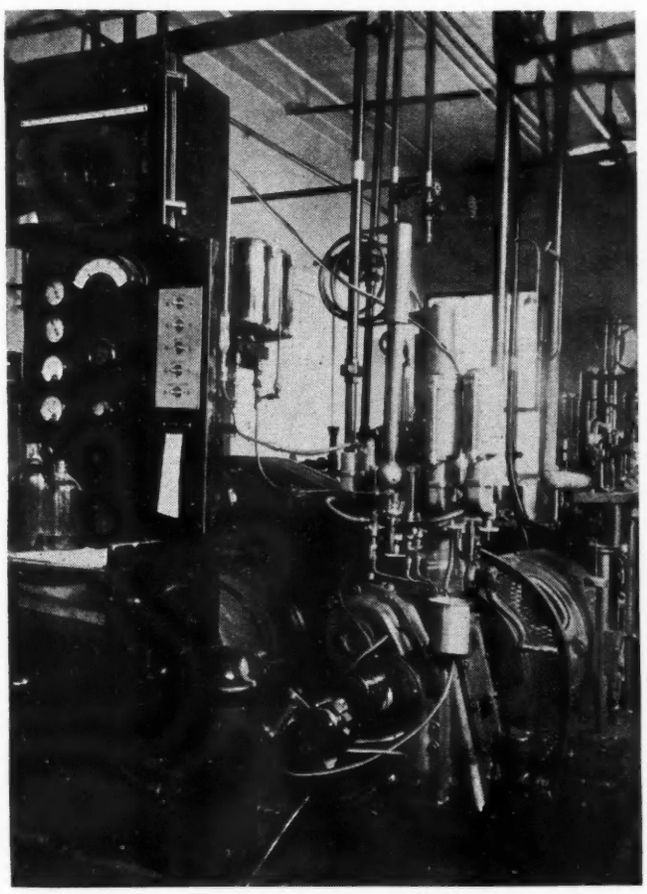
1 Four-ball extreme pressure lubricating oil testing machine.

1 Ignition timing analyzer by Wiedenhoff for thorough analysis of any make of ignition timer.

1 Apparatus for studying fuel injection pump and injection valve characteristics.

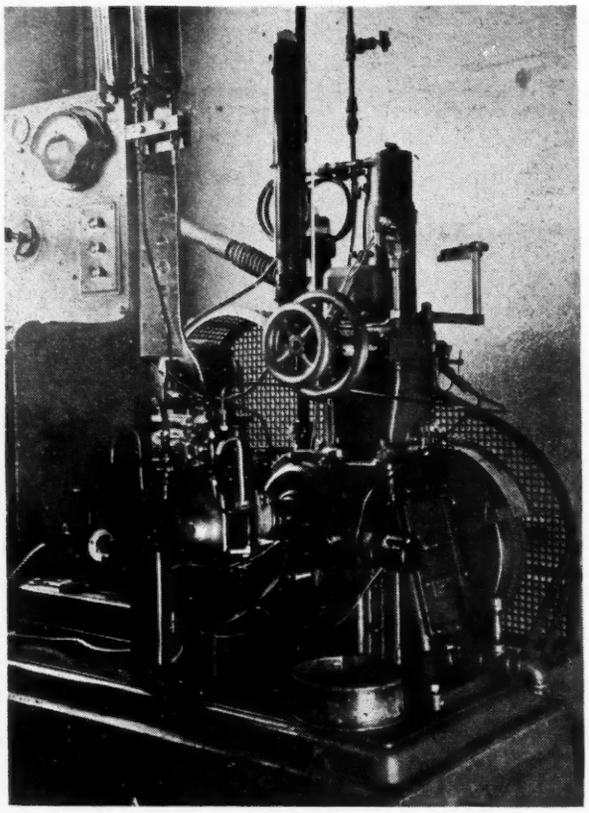
1 Stand for photographing engine parts.

Miscellaneous equipment including complete set of tools, drills, presses, lathes, etc. Cathode ray oscillograph for pressure indicator equipment.



(Above) Test stand and instrumentation for CFR engine fitted with Army cylinder

(Below) Cold-room being used for chassis dynamometer testing of farm tractor under winter weather conditions.

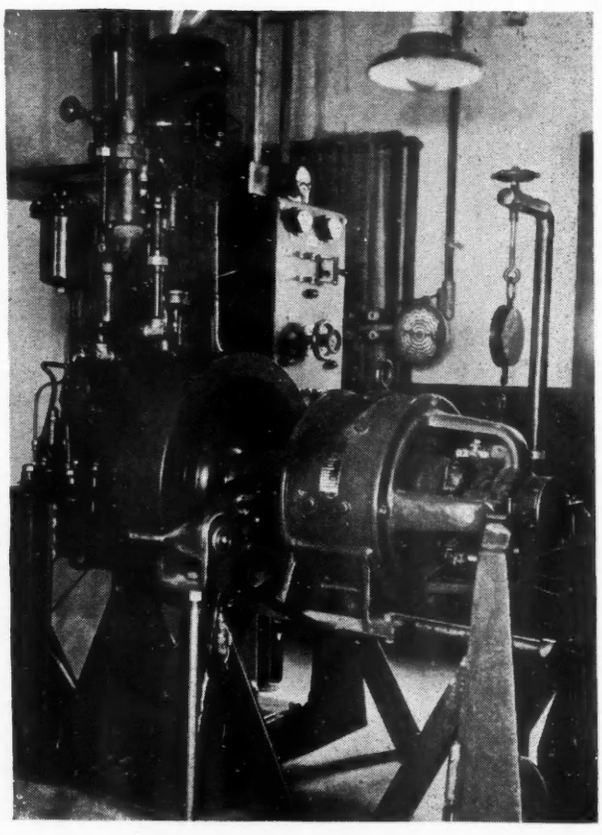


Close-up of standard CFR diesel engine stand

of a test stand onto which the car to be tested is driven and then anchored by the front and rear axles to hold it stationary. The rear wheels rest on rollers which allow the engine and power transmitting mechanism to run at any speed comparable with that at which it operates on the road. The rollers are coupled directly to an oil dynamometer, the purpose of which is to absorb the power developed by the engine. The load can be adjusted to any predetermined amount. Cooling coils of a direct expansion ammonia refrigerating system are in a coil loft directly over the test stand, and a large electrically driven disk type fan draws the air through the coils and directs it into the radiator of the car, reproducing the wind velocity encountered while driving. In this manner, the temperature of the room can be controlled and the radiator adequately cooled. Sensitive laboratory instruments can be readily used in conjunction with the chassis dynamometer, but would be inconvenient and unwieldy to handle while driving on the highway.

The equipment is well adapted to such testing as determining the antiknock rating of fuels in various cars. Fuels can be tested easily and quickly on the chassis dynamometer and also more accurately, because the important factor in this work, engine temperature, can be kept more nearly constant. The problem of finding a suitable hill or of properly loading the cars in knock-rating tests on the road is a difficult one, but with the dynamometer the time of change in speed can be kept constant for all cars.

"Startability" and "warming up" performance of gasolines having different distillation curves can be easily investigated for engines at low temperatures in the cold room. Such tests are then no longer dependent on uncertain winter weather and hazardous winter driving; also, the time required to chill the car down after a test is materially reduced by the strong blast of cold air delivered by the fan. Mileage tests can be run more accurately than on the highway because the varying effect of wind is eliminated and the speed and temperature kept more nearly constant. Investigations on the effect of viscosity index and pumpability of motor oils on engine performances are somewhat simplified by the cold room. The only road tests which are impossible on the chassis dynamometer as it is now installed are acceleration tests. The effect of the weight of a car could be reproduced by a flywheel on the roller shaft, but this would require a flywheel of the proper moment of inertia for each car tested.



Test set-up for Fairbanks-Morse, single-cylinder diesel engine

Just Among Ourselves

Just About Ourselves

ON Feb. 26, we hope you will remember, there was published the Twentieth Annual Statistical Issue of AUTOMOTIVE INDUSTRIES, which contained the essential statistics of the industry for the year 1937, and the working basis for many a 1938 sales and engineering scheme. With that out of the way, we turned to the compilation of some of our own statistics covering the same period.

During the year 1937, AUTOMOTIVE INDUSTRIES received more letters from readers than at any time in its recorded history. Many of these letters incorporated constructive suggestions which have been reflected in the subsequent editorial policy of the magazine. We have listened sympathetically, for example, to the demand for more engineering information about automobile racing-car design; we have augmented the amount of space devoted to new materials and metallurgy; we have published a series of section drawings of engines.

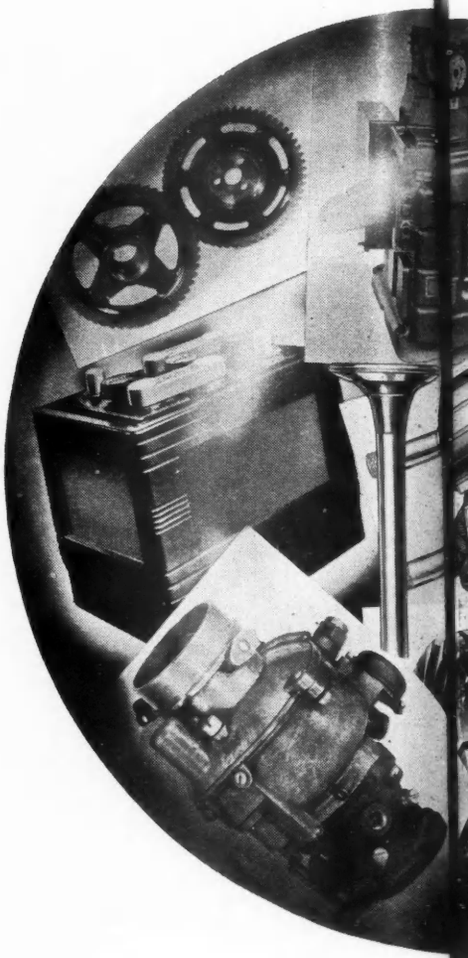
The business of editing is a business of infinite detail on which must be imposed, to re-abuse the old metaphor, some knowledge of forestry along with knowledge of how to cut down trees. Along the line we have attempted to improve detail wherever the opportunity offered, and to keep always in view the larger objective—a magazine reflecting the significant things to come.

For the future: there will be more consideration for some of the forgotten fundamentals in both sales and engineering of motor vehicles. Detailed announcement of the program will come later.

Meanwhile, the only way we have of knowing whether AUTOMOTIVE INDUSTRIES meets your individual needs is to have you tell us about it. Letters involving extended consideration cannot be answered immediately, but all are assured of earnest attention.

—HERBERT HOSKING

When Two Can Get Together—



the concerted efforts of the advertising and sales forces prove a short cut to results

By MABEL POTTER HANFORD

THERE was a time, not many years past, when the mouse-trap which all the world was seeking because it was better made, in itself represented all that could be done to create a market. Make it better — and that manufacturer's business and plant grew as his sales increased. That has ever been the inspiration for a manufacturer who had pride in his product. Yet during the past quarter of a century that mouse-trap industry must have evolved itself into a corporate business somewhat as follows:

The original manufacturer, product in hand, went forth to sell. His first customer, well pleased, passed the word along and the second customer was born, sending the manufacturer back to his shop to produce another mouse-trap. Being a sturdy and useful piece of merchandise, the news continued to spread until finally that manufacturer found that he must confine himself to a single function—either that of producing or of selling. Thus began the building of an industry.

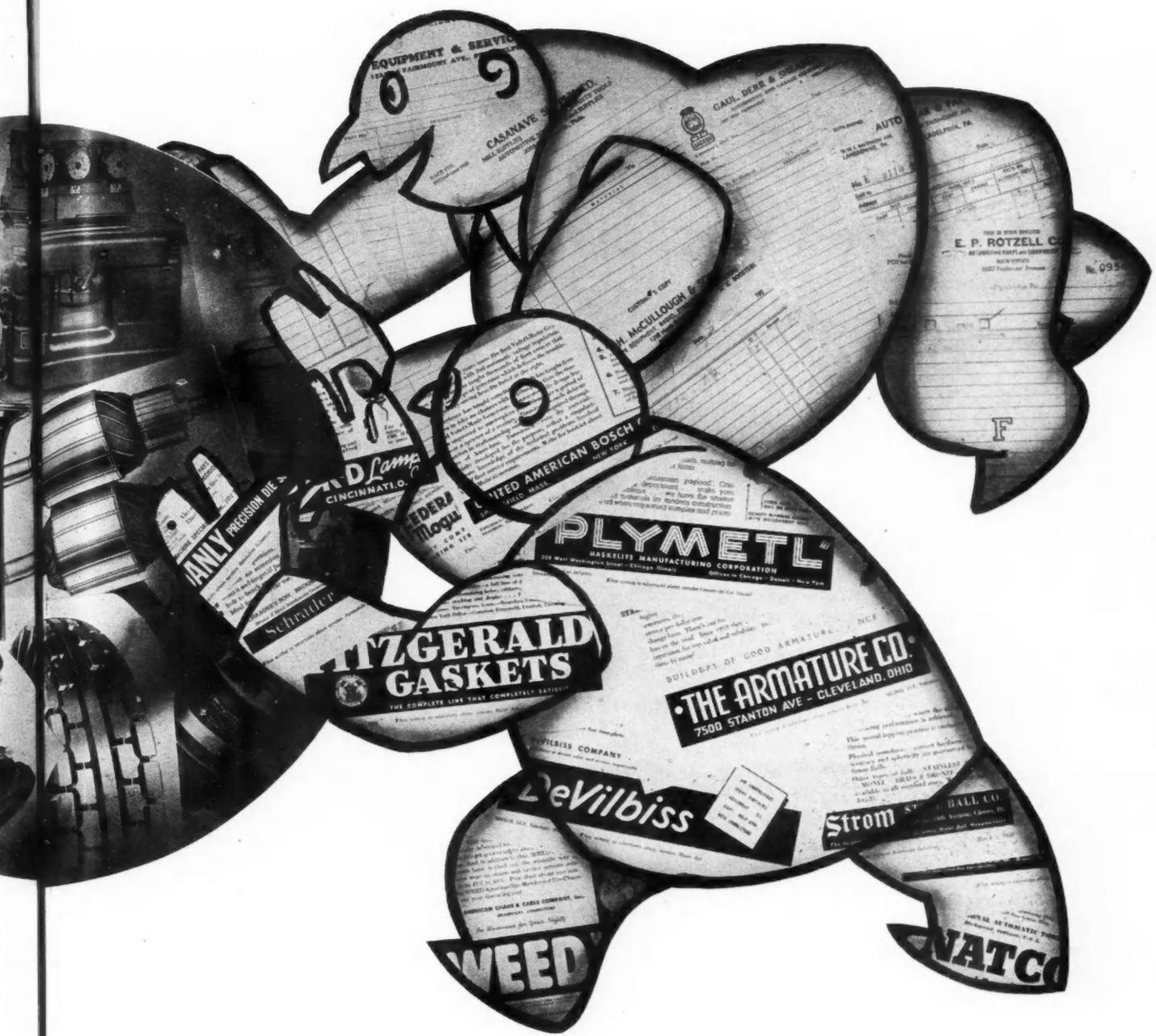
The plant grew and with its growing production men were added to make the product, salesmen to sell it, and somewhat later, advertising men to make customers aware of the product. For that individual consumer, once personally contacted, has become but a figure on the books. Salesmen were not expected to sell the buyer of *one* mouse-trap, but the buyer of traps by the gross. This latter buyer was the man who would concern himself with supplying individual buyers and would make his own profits from such transactions. In other words, he would create a little business of his own, functioning entirely by himself, for the most part, and interested primarily in making his own living from individual sales to individual consumers.

To help him, advertising was used by the manufacturer to bring the customer into the store, to make the sales transaction easy and satisfactory to both purchaser and dealer. Under such conditions, the sales department welcomed the advertising department and worked in harmony with it.

Always the sales and production departments have kept in close touch with each other. Not so, unfortunately for the real progress of industry, has been the relationship when the advertising department functioned separately from the sales department. Both production and sales departments have been inclined to look upon the advertising department as a stepchild—pleasant and sometimes a real joy, but rarely a favored and confided-in son. The production story has been hashed over by the sales department before the advertising department is permitted to hear it, and both production and sales departments too often think that the advertising department wants visions rather than facts.

There is a single factor that, more than anything else, influences distributers orders. There are plenty of signposts in this article, to keep one on the road to more business.

There is something amusingly childlike in the rivalry existing between sales and advertising departments when not headed by one individual or closely knit group. "A good salesman can always get the order" is still too often the motto of an individualistic sales depart-



ment, and acceptance of the advertising program is given but half-heartedly by a department living and breathing that motto.

Let us accept that the sales department has but one objective. That objective is—*sales*. Sales—which is the movement of goods from the production store-house to the dealer's shelves, the floor of the distributor. *Movement* of goods is based on such sales. Consumer desire and purchase is something which, in the main, the distributor and dealer must worry about, although the sales department may have accepted the premise that advertising is to bring the consumer into the store or display room. Indeed, more often than not, the sales department has used this consumer advertising to influence the dealer and increase his holdings.

Is it not astonishing, therefore, that in a department where the human element is so vital, there is often a complete shutting of the mind and eye to human reactions? Ask a salesman what his chief interest in business is and he will say, "Why sales, of course." Press the point—"*Why* sales?" and you will finally boil it down to "that's how I make my living." It is a personal matter, this making of sales, and no sales-manager is allowed to forget it for one moment. Yet how many salesmen, how many sales and advertising departments have remembered that the distributor and the dealer is thinking—and acting—along those self same lines?

That distributor, that dealer, is not concerned with the product as such, on his shelves or in his shop. What he is interested in is what he, himself, will eventually earn from handling and displaying that product. His selection and purchases of the products in the first place, is just the first step toward his own personal objective—a livelihood for himself, a home for his family, edu-

(Turn to page 398, please)

Cadillac's Attention to Details Contributes to V-16 Performance

***This is the third of three articles showing how the Cadillac engine was designed and produced. The first two articles appeared in the Oct. 23 and Nov. 27, 1937, issues of* AUTOMOTIVE INDUSTRIES.**

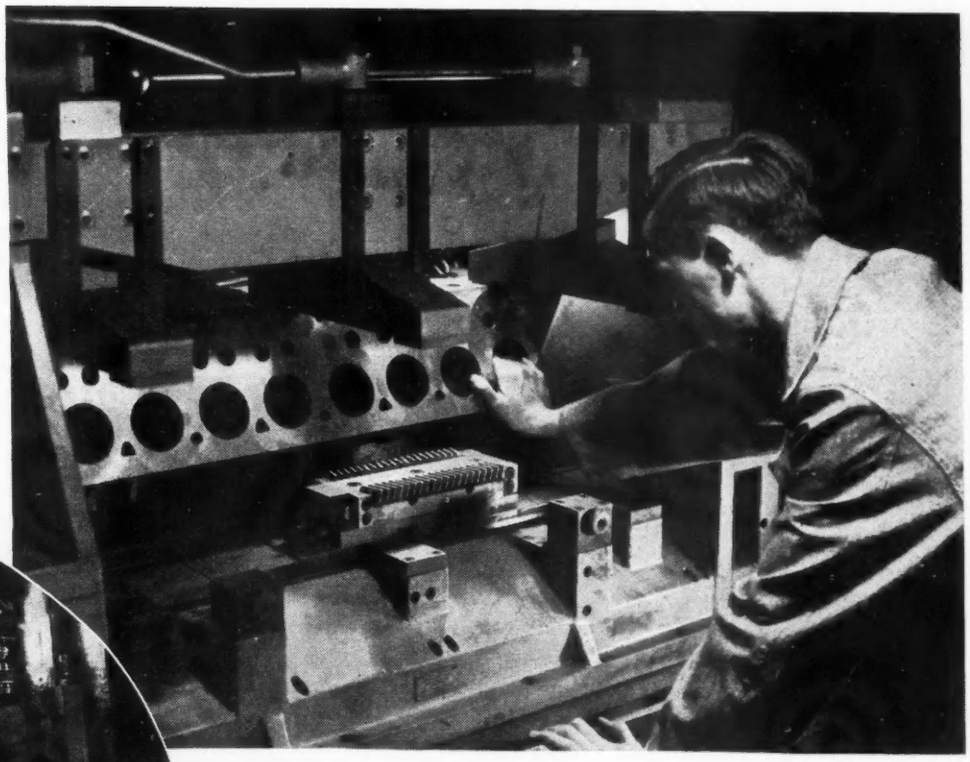
WHEN you lift the gleaming hood of any '38 Cadillac V-16, you will see a lot of engine—the V-16 job which is practically two eights-in-line with separate accessories. Eye-appeal is reflected in its external appearance, for Cadillac knows that many V-16 hoods will be lifted to show this remarkable powerplant.

By the same taken, Cadillac has devoted unusual attention to details of manufacture to assure the kind of performance and service expected by the owner of a V-16. The conception of engineering design was covered in a recent article in AUTOMOTIVE INDUSTRIES; the details of its manufacture form the basis of this article.

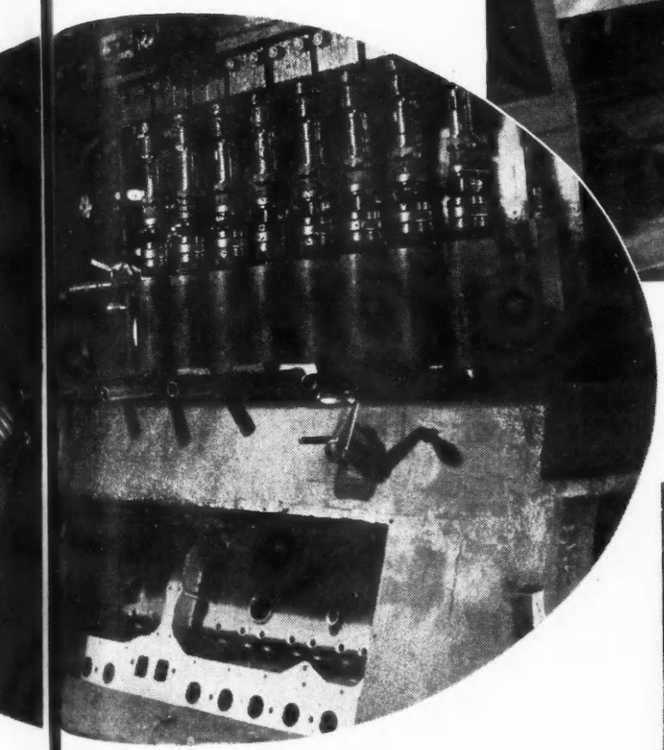
In setting up the manufacturing department for the production of the V-16 engine, Cadillac began with the premise that this engine would be built to the highest quality standards known in the automotive industry. Not that much could be done to improve on the methods used in producing the current line of V-8 cars, but something could be done to make quality control standards still more stringent. One example may suffice —on the V-8 engines, with relatively higher production, it is possible to have a fairly wide range of bore sizes since piston and ring assemblies could be selected to provide the fine specification clearances. On the V-16, the range of piston sizes is necessarily limited due to smaller volume and, consequently, the bores must be held right "on the nose" within a tolerance of 0.0005 in. on bore diameter.

Factory executives will be as keenly impressed as we were to learn that although the V-16 machine line is tooled for only 10 units per day (single shift), the equipment is of

Cincinnati No. 4 standard vertical milling machine is used on the second operation—rough milling top of cylinder block.

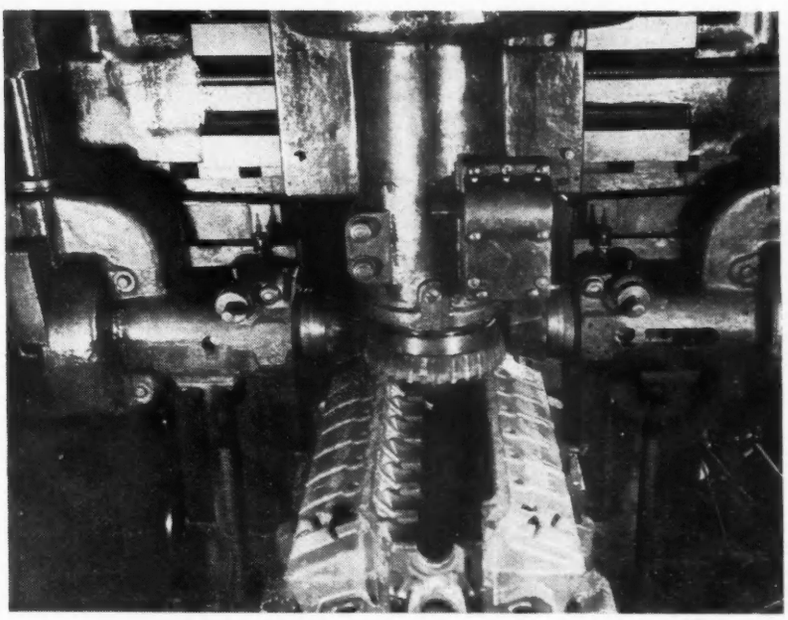


(Right) Colonial horizontal universal broaching machine is used for finishing the bearing locks by surface broaching. This is a close-up at the work - station, showing the detail of the broaching tool.



(Left) Barnes automatic honing machine, fitted with Micromatic hones, employes massive fixture to assure precise alignment in honing V-16 bores.

(Below) Ingersoll miller is used to rough and finish-mill oil pan rails and bearing locks.



precisely the same general character as is found on the V-8 lines. Although the machines are of the same type and, generally, of the same make, they are of decidedly advanced design reflecting the sum total of experience and refinement effected during the interval between now and the time the earlier machines were designed and built.

In fact the factory management is very much impressed with the features of the new line, particularly the way in which it was possible to swing the new machines into production without the customary try-outs and adjustments.

In analyzing the building of the V-16 engine, it may be noted that the only special problem was that of machining the block. Foundry procedure follows Cadillac experience with the V-8 and the V-12, now discontinued, while other parts such as connecting rods, crankshaft, etc., are similar in design to that of the V-8 and are machined in the same fashion.

One of the big problems involved in machining the new block arises from the fact that the cylinder iron is much harder than is used for the V-8 blocks and, consequently, imposes greater duty and wear on the cutting tools. This matter is being studied at the moment and will result

Cadillac Factory Routing of the V-16 Cylinder Block

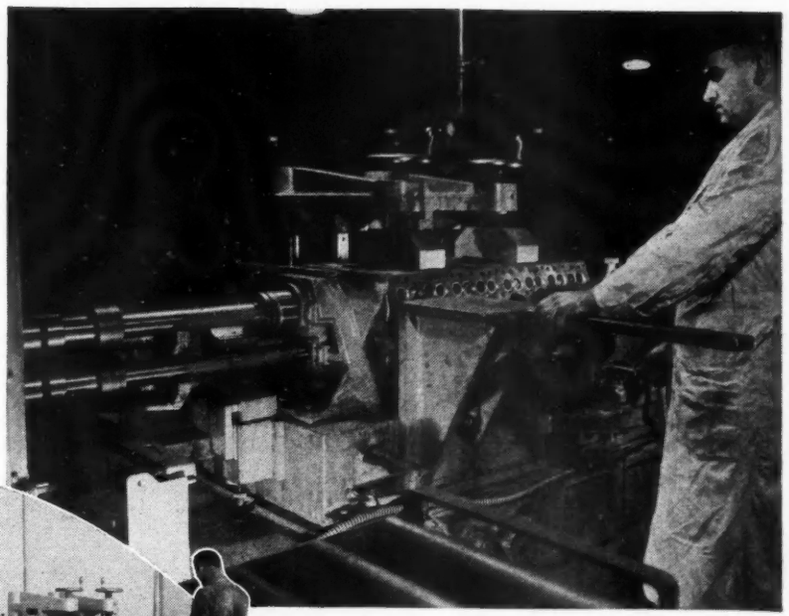
OPERATION	EQUIPMENT
Rough and finish mill oil pan rails, and mill main bearing locks	Ingersoll planer type miller
Rough mill top	Cincinnati No. 3 standard vertical mill
Rough mill bank faces	Standard Milwaukee horizontal mill (Simplex)
Drill and ream locating holes, drill oil pump screw holes—lower oil pump shaft hole—27 oil pan screw holes and oil holes from crank to cam bearing	Fox standard multiple drill
Drill 18 bearing cap screw holes — one oil pan screw hole and ream oil pump screw holes in vertical head and drill 9 oil holes through lower oil gallery hole	Foote-Burt special multiple drill
Counterbore 7 core plug holes and drill one drain hole in water jacket both sides	Foote-Burt special multiple drill
Finish broach bearing locks	Colonial special broach
Straddle mill main bearings and main bearing locks	Ingersoll special mill
Rough bore cylinder bores—(both sides)	Foote-Burt boring machine
Bore and counterbore valve throats, spot valve guide holes, and drill water circulating holes	Foote-Burt special 2-way drill
Drill valve guide bushing and tappet holes, drill cylinder head bolt holes	Foote-Burt special 2-way drill
Mill relief from cylinder bores to valve, chamfer burr	Barnes No. 246 drill
Countersink and tap 9 oil holes that pass through lower oil gallery hole drill. Countersink and tap motor support holes and countersink and tap cylinder head bolt holes	Hammond standard radial drill
Countersink and tap oil pan screw holes — counterbore and tap main bearing screw holes and tap oil pump screw holes	Hammond standard radial drill
Inspect	
Assemble main bearing caps and core plugs in sides of cylinder banks	
Core drill crank and cam bearings and drill 3 oil gallery holes—face front, counterbore ream cam bearings	Natco 2-way horizontal drill (special)
Face rear end and rough oil retainer groove	Newton planetary mill
Face front end	Milwaukee Simplex mill
Semi and finish bore crank and cam bearings and counterbore rear crank bearing	Natco one way horizontal drill (special)
Finish bore oil retainer groove	W. F. & John Barnes boring machine (special)
Mill relief between valves	Partool milling machine (special)
Check clearance for Foote-Burt boring bar and chip 8 clearance and spots	
Bore valve guide and tappet holes	Foote-Burt 2-way horizontal drill (special)
Drill 18 manifold stud holes, valve cover screw holes, support plate screw holes, distributor brackets screw holes, and drill and ream vacuum	Fox standard multiple drill
Drill 32 oil holes in tappet holes, one ⅛ in. pipe hole in rear end of gallery hole—9 cover plate holes and counterbore 2 distributor bracket dowel holes	No. 15½ Foote-Burt multiple drill (special head)
Countersink and tap oil connecting manifold screw, cover plate screw vacuum pump support screw holes, drill, ream and counterbore oil gage hole and drill breather holes in cylinder cores and chamfer vacuum pump hole	Hammond standard radial drill
Bore and face 2 oil filler holes and bore port holes	Barnes No. 246 drill
Semi-finish bore cylinder bores	Foote-Burt boring machine
Chamfer cylinder bores	No. 15½ Foote-Burt drill (special multiple head)
Back spot face valve spring seats	Barnes drill (special)
Finish ream valve guide bushings tappet holes and clean and burnish tappet holes	Hammond standard radial drill
Assemble valve guide bushing	20-ton Fox power press
Ream valve guide bushing holes	Hammond standard radial drill
Inspect	
Drill screw holes and dowel holes, counterbore plug holes in rear end	No. 2 Bausch hydraulic multiple drill
Drill front cover, water pump and camshaft bearing screw holes — cover dowel holes and one 0.375 in. drill hole	No. 2 Bausch hydraulic multiple drill
Countersink and tap screw holes in both ends, ream dowel holes, assemble core plugs in rear end	Hammond standard radial drill
Water test	Special fixture
Drill bore, counterbore and ream distributor shaft hole	24 in. Barnes standard drill
Drill, spotface, and ream oil pump shaft hole	24 in Barnes standard drill
Drill 3 oil holes in rear cam bearing, one in vacuum pump shaft hole	Portable electric drill
Finish mill top	No. 3 Cincinnati standard vertical mill
Finish mill cylinder bank faces	48 in. Cincinnati standard hydraulic horizontal mill
Finish bore cylinder cores	No. 45 Heald Boromatic (special)
Rough and finish hone cylinder bores	Barnes 8-spindle hydraulic honing machine
Seat valve seats	Hand tool
Inspect	
Assemble tap all valve seat	Detroit valve grinding machine
Wash in kerosene, blow off wash in hot soda water, steam, and assemble valves and bearing cap screws	Special washer
Assemble plugs	Hand tool
Assemble camshaft bushings and assemble Welch plugs and taper oil gallery plugs	Springfield horizontal press "Pull 'Em All"
Assemble flywheel housing, face center bearings, and bore and face flywheel housing	W. F. & John Barnes planetary facing and boring machine (special)
Layout drill and tap (2) oil gallery bypass holes	Portable electric drill
Inspect	

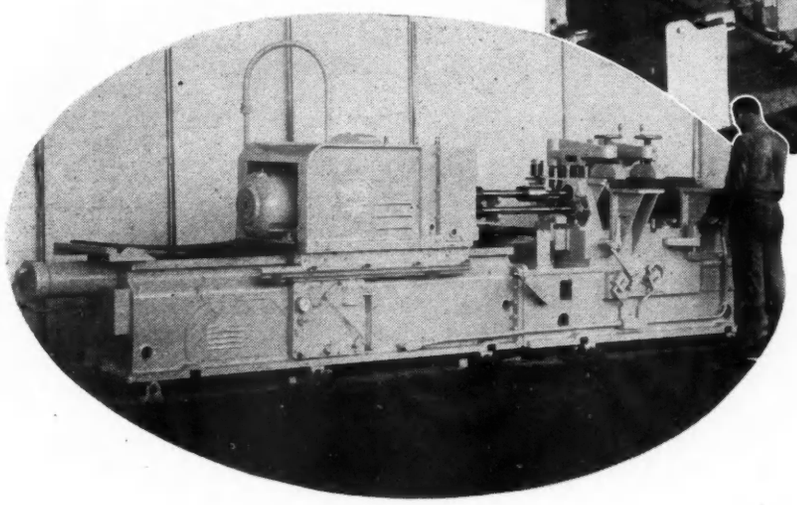
in the use of special cutting tool materials more suitable for the harder alloy irons.

Apart from the new items of equipment, the general procedure follows Cadillac engine building practice which was described in AUTOMOTIVE INDUSTRIES March 6, 1937. This covers the details of magnetic testing of bores to check cylinder wall thickness, the gaging of pistons for size with the Electrolimit gage, machining of rods, etc.

It might be of interest to examine in detail some of the operations noted on the cylinder block routing, reproduced elsewhere. The first operation is that of rough and finish-mill on an Ingersoll planer type mill. This also includes rough-mill of the main bearing locks with a subsequent finishing operation on a special Colonial surface broaching machine. This is a universal horizontal broaching machine of 10-ton capacity fitted with a special work fixture. The broaching ram has a stroke of 60 inches.

Cylinder bores are rough-bored, one bank at a time in an eight-spindle Foote-Burt boring machine, semi-finish-bored on another Foote-Burt, then finish-bored on a Heald precision boring machine with single-point cemented-carbide fly-cutters. The Heald Bore-Matic used on this operation is the most advanced machine of this type in use in the industry. As illustrated, it is an eight-spindle machine, taking a bank of eight cylinders at a time.



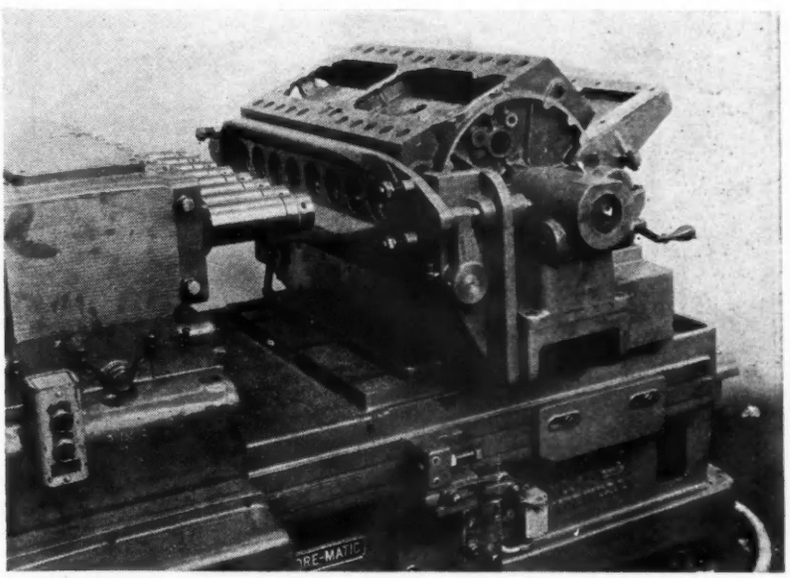


Close-up of work station on special Natco two-way horizontal boring machine for core drilling cam and crank-bearing holes. In addition, the machine drills three oil gallery holes, faces front, and counterbores and reams cam bearings. Some idea of the size of the machine Natco uses for boring cam and crank bores may be gained from the installation shown at the left.

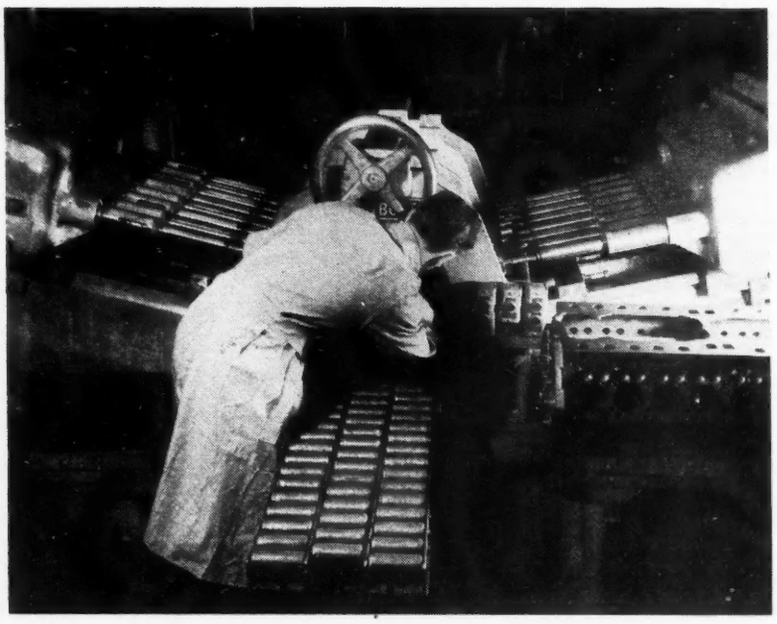
The block is held in a special tilting fixture bolted to the machine table. The fixture is equipped with a platen mounted in trunnion bearings at the right end and having beneath it two hydraulic cylinders at the left end which are operated for raising the platen to a horizontal position to receive the block.

When the hydraulic valve lever at the rear of the fixture is thrown over, the platen lowers to a 22½ deg. angle.

A hand lever at the front of the fixture actuates a rack and pinion which causes a locating dowel to en-



Heald Bore-Matic, No. 45, fitted with eight massive precision-boring spindles tipped with cemented-carbide fly-cutters, is used for finish-boring the cylinder bores. Each block is finished in two settings on this machine.



Footburt special two-way drilling machine is used to bore and c'bore valve throats, spot face valve guide holes, and drill water circulating holes.

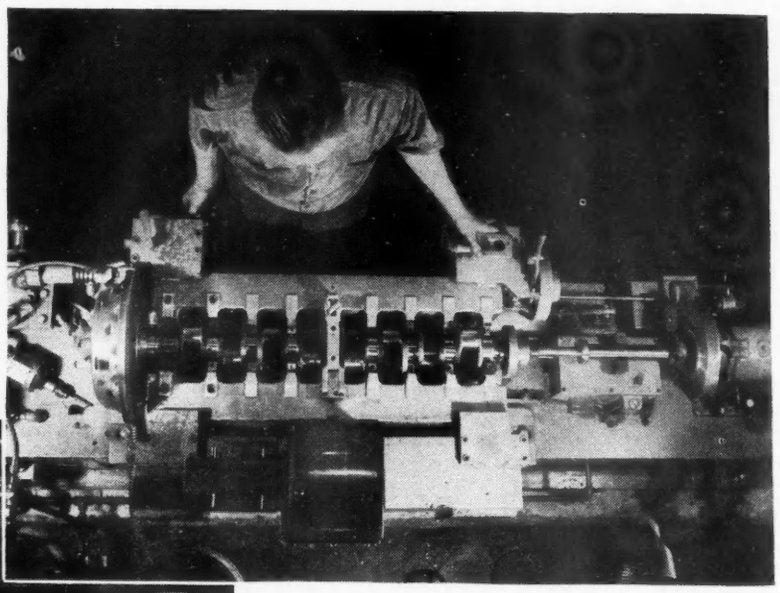
ter a ¾ in. hole in the bottom of the crank case thereby locating the block endwise.

By a wedging action of the slide, the block is securely clamped and located so that the front bank of cylinders is in line with the boring spindles. A uniform pre-determined clamping pressure is exerted on the block by a screw working in a spring-loaded safety nut.

To start the boring cycle the operator first depresses the "In" push button on the control panel and the table runs in at rapid traverse. Just before the tools contact the block, a cam on the table depresses the boring valve lever positioning the boring valve, and the table slows down to boring feed. The tail of this lever also releases a switch which automatically starts the boring heads. The eight cylinders now are bored simultaneously. At the end of the stroke the table strikes a positive stop and a dog on the table trips another switch which stops the boring heads.

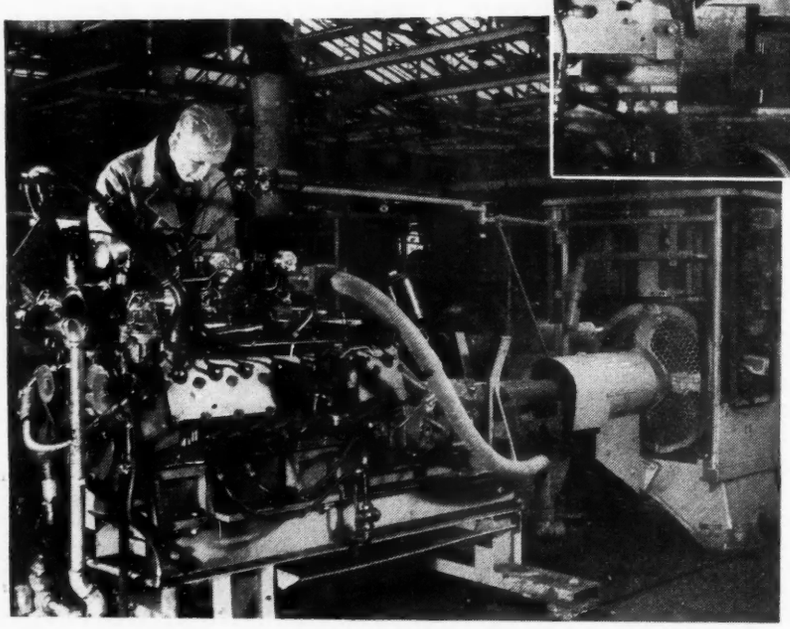
In withdrawing the tools from the finished cylinders, drag lines are eliminated by first backing off the tools. When the operator presses a button on the control panel, six hydraulic hold-down cylinders release clamping pressure on the cross slide and the cross slide retracts by action of a hydraulic cylinder at the rear. Movement of the cross slide also trips a switch which momentarily reverses the boring heads. By means of a ratchet and pawl mechanism in conjunction with a roll clutch attached to the end of each boring head unit, the boring tools stop at the end of reversal all in the same horizontal position.

After boring on the Heald Bore-Matic, the bores are rough- and finish-honed on a Barnes eight-spin-



(Above) Huge V-16 crankshaft dynamically balanced in new horizontal type GMR balancing machine. The typical GMR card may be seen in the foreground.

(Below) Cadillac V-16 powerplant being put through its paces on the dynamometer



dle hydraulic honing machine fitted with Micromatic hones. Each block is handled in two settings for the honing operation.

A specially designed Natco two-way horizontal drilling machine is used for core-drilling cam and crank bearings, drilling three oil gallery holes, facing the front end, and counterboring and reaming the cam bearings. The machine consists of two Natco Holesteel floor type heads mounted on a special steel pedestal. The block is located on its finished bottom face, over pins in the two master locating holes.

Following two facing operations on a Newton planetary mill and a Milwaukee Simplex mill, the cam and crank bearings as well as the rear crank bearing counterbore are semi- and finish-bored on a one-way Natco boring machine fitted with a special boring bar positioning mechanism.

After completion of the major metal cutting operations, each block is washed in a special washing machine to remove all traces of chips, oil, and other materials that may accumulate in the process.

Following assembly, the engines go through a strenuous test on the dynamometer and, incidentally, must conform 100 per cent to the established specifications as to performance and output.

The brief high-spotting given here is supplemented by a well-chosen group of illustrations that may well serve to provide a general perspective of the machine line and much of the new items of equipment.

For Winter Traffic in Northern Finland

Editor, AUTOMOTIVE INDUSTRIES:

TRANSPORTATION of passengers, mail and light cargo on the wide plains of northern Finland is quite a problem in winter time. The Finnish Railway has its northern terminus at Rovaniemi - Kemijarvi, and from there to the shores of the Arctic Ocean is a distance of 350 miles. In the past, traffic in that part of the country has been carried on in winter time by means of horse-drawn sleds, but considerable difficulty was always experienced, and there were many irregularities in the service.

To improve communications during the long winter in these out-of-the-way places, where the highways cannot be kept free from snow (for motor traffic) because of the prohibitive cost which would be involved, a young mechanic in Rovaniemi some years ago began experimenting with a "Snowglider," a motor vehicle in which the steering and propelling elements comprise a combination of skis, wheels, and endless tracks or chains.

The first "Snowglider" was a cross between a bus and a truck, having a carrying capacity of five passengers and 2500 lb. of cargo. It was placed in service during the late autumn of 1935 and proved quite successful. As may be seen from the illustration, the vehicle is provided with skis at the front, and owing to the load carried by them, these pack the snow and thereby enable the lugs on the chain links to secure sufficient hold to propel the machine. Where the roads have been cleared of snow, the chains can be easily removed, and the vehicle can then be operated like a conventional one. The skis are located sufficiently high to give the necessary road clearance for such operation.

For the winter of 1936-7, a number of Snowgliders with a carrying capacity of 10 passengers and 5000 lb. of cargo were built, the Ford chassis being used. The standard weight of the vehicle is 6000 lb., and its speed on snow-covered, uncleared roads is 20-25 m.p.h.

Snowdrifts of considerable size do not prevent the operation of this vehicle, and during the past winter the mail and passenger traffic of this remote section was kept on schedule, to the great satisfaction of its sparse population.

—HANS A. BRANDERS.

Electro-Magnetic Fuel-Injection

designed to maintain a constant mixture ratio under all operating conditions

AN electro-magnetic fuel-injection system for low compression engines, known as the Caproni-Fuscaldo system, has been developed in Italy and was exhibited at the recent Milan automobile show. It appears to be intended principally for airplane engines. One of the advantages claimed for the system is that it permits of very high engine speeds, giving up to 100 injections per second, which correspond to 12,000 r.p.m. of a four-cycle and 6000 r.p.m. of a two-cycle engine. The injection period itself normally extends over only about 1/1000 second, and there is no lower limit to its duration as by means of the control lever the quantity injected can be cut down to zero. Stroboscopic examination of the jet is said to have shown that it retains its characteristics up to the highest speeds and down to the shortest durations.

A diagrammatic drawing of the system as applied to four-cylinder engines is shown in Fig. 1. It comprises (1) four electro-magnetic injectors (1, 2, 3, 4) which are mounted on the cylinder block, either in the inlet passage directly ahead of the inlet valve, or in the wall of the combustion chamber, in such a position that the atomized fuel is thoroughly mixed with the incoming swirling air stream; (2) the engine-driven electrical distributor 5, whose function it is to distribute current from the storage battery 6 to the injectors in the various cylinders, during the inlet stroke of the particular cylinder, whenever the switch 7 is closed; (3) the actual injection apparatus, including the engine-driven rotary pump 8 which draws fuel from the main tank 9 and forces it into the fuel line 10 leading to the injectors; (4) the automatic atmospheric pressure compensator, consisting of a bellows-type cartridge, which is subjected to the pressure of the atmosphere and reduces the amount of fuel injected in direct proportion to a reduction in the atmospheric pressure; (5) an air throttle, of the butterfly or other type, which is operated by hand.

It is claimed that with this system the fuel quantity injected is always proportional to the speed of the engine and to the absolute pressure of the atmosphere and that the mixture ratio, therefore, remains constant under all operating conditions.

The injectors are of the closed type, being provided with an internal valve which is held to its seat by a small spring. The valve is opened by the magnetic pull of the solenoid when the latter is energized by current from the storage battery, and it is closed by the spring as soon as the current flow ceases. As the

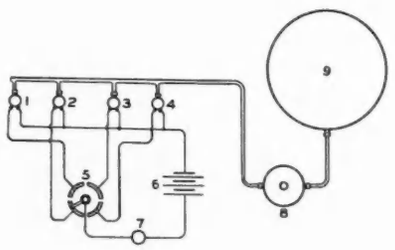
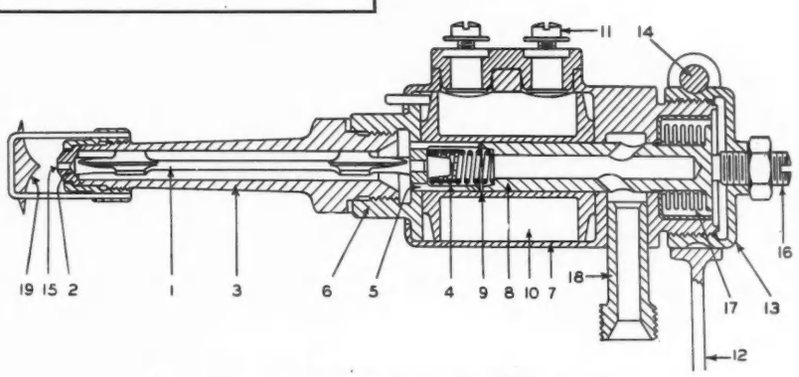


Fig. 1—Diagram of Caproni-Fuscaldo fuel-injection system



1, injector valve; 2, valve seat; 3 injector body; 4, injector-valve spring; 5, 6, 7, 8, soft iron pieces forming the magnetic core of the solenoid; 9, air gap; 10, coil; 11, binding post; 12, control lever; 13, screw cap; 14, clamping bolt; 15, injector orifice; 16, adjustable stop screw; 17, bellows preventing fuel leakage from injector; 18, pipe connection; 19, atomizer-diffuser.

Fig. 2—Section of Caproni-Fuscaldo injector

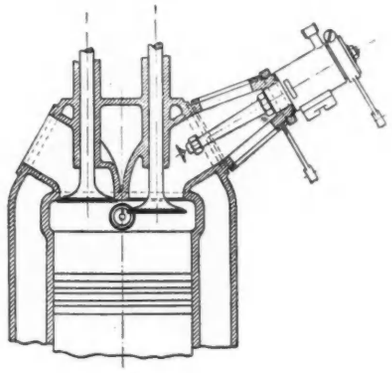


Fig. 3—Mounting of injector on valve-in-head engine

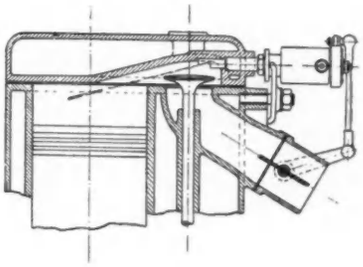


Fig. 4—Mounting of injector on L-head engine.

interior of the injector always remains in communication with the source of fuel under pressure, injection continues as long as the valve remains open, which in turn depends on the time the current continues to flow.

It is claimed that—assuming the valve to seat properly—injection starts and stops instantly, and there is no valve flutter and consequent after-drip; and that the rate is constant throughout the period of injection. The duration of injection and its proper timing with relation to the inlet stroke can be accurately adjusted, and the injectors of all cylinders can be perfectly synchronized.

The injection pump works at a comparatively low pressure, 75 to 90 lb. per sq. in., and is said to be a very reliable piece of apparatus, which claim is made also for the electrical distributor, which is not unlike the corresponding part of an electrical ignition system.

The quantity of fuel delivered by the injection valves can be controlled by means of the valve lift; the duration of injection can be varied by a suitable change in the electrical distributor, and the pressure under which the fuel is injected can be varied at the pump independently of the engine speed. Any one of these three variables can be acted on by the automatic atmospheric pressure compensator.

An injector of the variable-delivery type is shown in section in Fig. 2. The light weight of the injector valve (0.004-0.006 lb.) and the small lift, said to be only a few tenths of a millimeter at full delivery, reduce the inertia effects, and the small current required to magnetize the soft-iron core of the solenoids makes hysteresis effects negligible. The fuel is said to issue at great velocity from the orifice 15 of the injector, and it is atomized and distributed by being thrown against the atomizer-diffuser 19, which latter is given different shapes, according to the location of the atomizer and the form of the combustion chamber. Fig. 3 shows the method of installing the injectors on engines with valves in the head, while Fig. 4 shows their installation on side-valve engines.—*Auto-Moto-Avio.*

Octane Number 73 is Proposed as Minimum by Austrian Touring Club

AMONG a number of resolutions adopted by the Austrian Touring Club, which was reorganized some time ago, is one recommending the adoption of a minimum octane number for automobile fuel. The number suggested is 73. This is a rather high octane number, and it is believed that the intention is to favor the use of gasoline-alcohol mixtures, alcohol imparting superior anti-detonating qualities to the mixture. The Austrian Minister of Commerce, moreover, has urged the gasoline "Cartel" (trust) to lower the price of gasoline five groschen and of lubricating oil two groschen, and also to give parties outside the Cartel a chance to participate in the business, of which they have been deprived by lack of capital since Austria broke with Roumania and secures all of its gasoline from the United States. The recommendation is based on the fact that the prices of gasoline in world markets has dropped considerably. The Cartel at first was disinclined to accept the proposition of the Minister, but about the same time this decision was reached the Touring Club published its resolutions, one of which called for lower prices on motor fuel. Another one asks for lower fuel prices for foreign tourists visiting the country and cites the favorable experiences of Switzerland and Italy in the application of this plan.

When Two Can Get Together

(*Continued from page* 389)

cation for his children. He tries to be as careful in the selection of the products he buys or the franchise he accepts, as the manufacturer's own production department is careful of the materials that go into that product. He is not concerned quite so much with quick profits as with satisfied and repeat customers. And he is not a stabilized individual in spite of the easy, complacent belief of many a sales-manager that he is a satisfied and happy dealer. No dealer and no distributor is, *per se*, a satisfied dealer or distributor as long as he is a live business man, capable of thinking for himself, capable of growing.

Because of this complacent belief by the sales department, and because of an unsound conviction on the part of both advertising and sales departments that advertising is not completely intertwined with merchandising and sales, many an advertising manager and his agency has been permitted to operate in complete ignorance of the problems with individual distributors and dealers. The link between the two departments has but one side to it. Sometimes it holds, but far too often the loop on one side slips off that open link, and advertising has spurted ahead on a rash selling plan to bewitch consumers, or the sales department has failed to obtain the anticipated cooperation of the distributor or dealer.

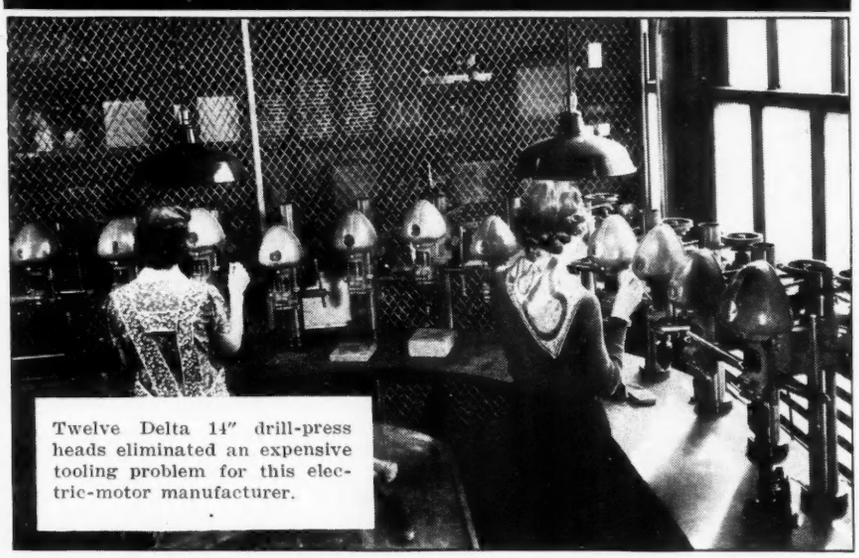
Let us see what these distributors and dealers have been doing these past five years when business has spun cobwebs across doorways and invited the squirrels to chase hazelnuts across customerless floors. They have been thinking—believe it or not—about just one thing—*SALES*. Nothing but sales. For sales are the source of their income, their livelihood. They have been looking at their stock, at their franchise. And—what is more important to the manufacturer—they have been looking at the stock of the competitor across the street, the franchise of the dealer down the avenue. And they have been studying methods of operation, protection against waste, handling of stocks, sales approach to the infrequent customer—a hundred such matters which will save the business for the present and provide the stepping stone to go forward with return of business.

Thinking of all these things, the distributor or the dealer has sought some place for an answer to his questionings, a solution to his problems. And he has found them in his trade journal. How do we know? Cold—hard, unimpeachable figures tell us. Because these dealers and distributors are reading their trade journals as never before. More of them are reading their business papers now than did five years ago. The audited circulation statements of the leading automotive merchandising and service publications, added together, show an increase of many thousands of readers in that period.

Dealers and distributors and service men are writing in much greater numbers to the editors and stirring up a great increase of editorial activity to reflect in the pages of the trade journals this growing, this demanding urge for information and help.

If this means anything at all, it signifies that the distributor and the dealer are doing a lot of their own thinking. Nor are the trade journals which they are reading of

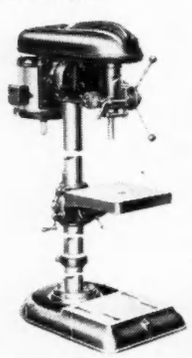
HERE IS THE ANSWER
TO MANY OF YOUR DRILLING AND TAPPING PROBLEMS !



Twelve Delta 14" drill-press heads eliminated an expensive tooling problem for this electric-motor manufacturer.

MULTIPLE DRILLING SETUPS ARE EASY WITH DELTA LOW-COST DRILL PRESSES AND DRILL HEADS

A movie-camera manufacturer uses an eighteen-head straight-line unit to cut costs and eliminate extra handling of work . . . a carburetor manufacturer uses six bench drills in line, eliminating the need for an expensive six-spindle machine . . . an automotive manufacturer installs six heads, used horizontally, vertically and at various angles, to drill and tap die-cast radiator grilles . . . an ignition-parts maker uses twelve standard 17" drill presses, set in U-formation, to cut cost and eliminate two expensive machines . . . these are only a few of the many ways in which high-production shops are solving their drilling and tapping headaches with Delta drills and drill heads.



Delta drill presses are low in first cost, but will do all the work of more expensive machines. They require no lubrication, and cost practically nothing for maintenance. They consume little power—from ⅓ to ¾ H.P.—and are highly portable. Delta drill heads can be installed vertically, horizontally, or at any angle. These are some of the reasons why these machines are so popular.

DELTA 11", 14" AND 17" DRILL PRESSES

Made in 11", 14" and 17" sizes, drill capacities from No. 60 to ¾", speed ranges from 385 to 5000 r.p.m., Delta drill presses are adaptable to a wide range of work. All models equipped with New Departure self-sealed ball bearings, requiring no lubrication.

Let us tell you more about Delta Drill presses. Drop us a letter or postcard today.

DELTA MANUFACTURING CO.
683 E. Vienna Avenue Milwaukee, Wisc.

interest primarily because of the editorial pages. The advertising page is being fingered and read and —studied. The present franchise with a manufacturer may appear exceedingly uninviting compared with the franchise which a competitor manufacturer is offering. The dealer is learning, not so much perhaps about the products now on his shelves, as about the products he does not handle, and he is reading things about all products which he knew only by hearsay before. He is wondering how he can make more profits, either from what he now stocks or represents, or from what he might stock, the franchise he might, perhaps, obtain.

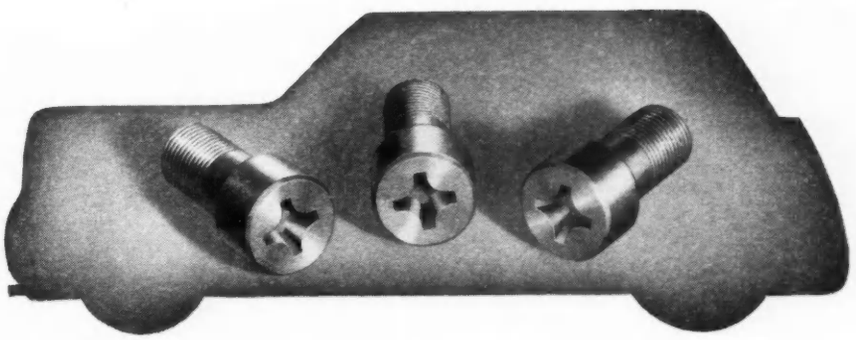
And—he may very well be wondering why the manufacturer who has stocked his shelves, signed his franchise, doesn't talk to him about the product in his trade journal. He wonders if the manufacturer considers that as a dealer he isn't worth cultivating, worth advertising to his trade paper. If not—what is wrong? Is it with the dealer himself? He does not think so. And—if he is the type of dealer who is doing his own thinking, his own reading these days, he is right in believing that the fault lies with the manufacturer. So—the dealer begins to ask himself certain pointed questions. He goes over his present franchise, checks his stock, watches his reactions when the good-natured salesman comes in again with his order book open in his hand. Thinks he is just a merchant who isn't reading his trade journal, does he? Well—maybe there is something in what that competitor says in that last advertisement which would be worth hearing about. And off goes a letter which eventually puts a competitor's product in the display case.

There—in that dealer, who is a very human sort of a fellow concerned entirely in making a living, supporting his family, educating his children—there is the *cam* around which rolls the whole of trade activity. The pity of it is that the sales department has so often forgotten to tell the advertising department how important that "cam" is, or that the advertising department, a bit unused to talking to a hardboiled individual interested in facts not fancies, concerned with what he "can make out of it"—shies away and limits its efforts to bringing the consumer into the store—if advertising can do it. Good—as far as it goes—but ask any dealer whether he ever switched a customer from one brand to another. On the other hand—better not ask him. His reply may bring a "gloomy Sunday" into your life.

Solution? Just one—close the open link between advertising and sales departments, even if you have to consolidate them under one head! Induce the advertising department to send a man around with a salesman on his next trip to listen—to ask questions—to then listen some more. Maybe that distributor and that dealer is a bigger influence on sales than anyone gives credit. But—there are no "maybe's" that he is reading his trade journal these days. And that is something that calls for talking it over with the advertising department.

Data on the Mixture Gasoline and Alcohol

DURING recent years the interest in the use of mixtures of gasoline with ethyl alcohol as engine fuels has increased because of the desire to provide an outlet for agricultural products which can be converted into ethyl alcohol. One of the



PHILLIPS SCREWS KEEP GAINING NEW USERS

One of the oldest and largest manufacturers of higher priced cars has recently effected a simplification of their assembly problem by the application of the Phillips recessed head to an important cap screw.

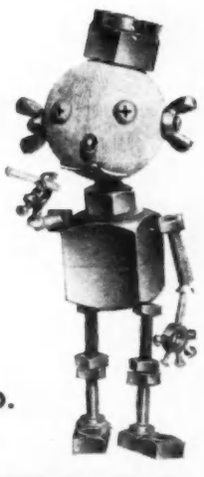
The advantages of the recessed head appeal particularly to automotive manufacturers. It is self centering on the driver, holds the driver from slipping, eliminates head breakage, permits faster driving, simplifies "hard to get at" jobs, makes a better appearance.

Let us quote you on Phillips Screws.

Sub-license for Phillips Screws granted by American Screw Co. Patent Nos. 2,046,837; 2,046,839; 2,046,343; 2,082,085; 2,084,078; 2,084,079; 2,090,338.

NAT SAYS . . .

No odes are written to a nut,
Or bolt or screw or rivet,
But if they didn't do their job,
Your life, you couldn't live it.



National PRODUCTS

THE NATIONAL SCREW & MANUFACTURING CO.
CLEVELAND, OHIO

major difficulties in connection with the use of this type of fuel is that only a very small amount of water may cause the mixture to separate into two layers.

The temperature at which separation occurs depends upon the particular gasoline and upon the proportions of gasoline, ethyl alcohol, and water in the mixture. In a previous investigation, data were obtained on the separation temperatures of mixtures in various proportions of 23 different gasolines with ethyl alcohol containing various percentages of water. From these data, it is easily possible to obtain the water tolerances of any of these gasolines at any given temperature within the range investigated. Analysis of the water tolerance values indicated certain similarities in the trend of water tolerance with composition of the mixtures when comparing the results with different gasolines. This suggested the possibility of deriving a general empirical equation for the water tolerance of mixtures of gasoline and ethyl alcohol and of assigning to any gasoline a characteristic constant which would be indicative of the water tolerance of any mixtures of this gasoline with ethyl alcohol.

The derivation of this empirical equation and the characteristic constants as calculated for each of the 23 gasolines are set forth in RP1059 by Oscar C. Bridgeman and Elizabeth W. Aldrich in the January number of the *Journal of Research*. The difference between the experimentally determined separation temperatures and those calculated from the equation was on the average 1.4 deg. C., and the difference between observed and computed water tolerances was about 0.005 per cent of the total mixture.

● For many years, the diamond has been a symbol of high quality and intrinsic value.

For many years—ever since the earliest days of the automobile industry—the **Spicer** diamond has also been a symbol of high quality and outstanding value.

Today as then, most passenger cars, trucks and buses are **Spicer**-equipped—convincing proof of the confidence which leading manufacturers have always placed in **Spicer** products.

Not only as original equipment, but also for replacement purposes, all **Spicer** products measure up to the high standards of which the diamond is a most fitting symbol.

Spicer Manufacturing Corporation • Toledo, Ohio

BROWN-LIPE	SALISBURY	SPICER	PARISH
CLUTCHES and TRANSMISSIONS	FRONT and REAR AXLES	UNIVERSAL JOINTS	FRAMES READING, PA.

Critical Solution Temperatures

If methyl alcohol were used in a gasoline-alcohol engine fuel, the amount of water which would cause separation of the mixture into two liquid layers would be even smaller than if ethyl alcohol were used. On the assumption that mixtures of the higher aliphatic alcohols with gasoline might have a greater water tolerance, an investigation was undertaken by Elizabeth W. Aldrich, of the water tolerances and separation temperatures of mixtures of gasoline, some of the higher aliphatic alcohols, and water. The first of these alcohols studied was *n*-propyl alcohol, and measurements were made of the temperatures of separation into two phases in solutions of known composition. For comparison, similar data were obtained on mixtures of the same gasolines with ethyl alcohol.

A comparison of the results, which are given in the *Journal of Research* for January (RP1060), showed that at all temperatures of practical interest, the water tolerances of mixtures of gasoline with *n*-propyl alcohol are greater than those of mixtures of gasoline with ethyl alcohol containing the same percentage of alcohol. However, when the mixture contains *n*-propyl alcohol, if separation occurs below approximately —15 deg. C., the second phase is solid, or if separation occurs above this temperature, the liquid which separates will freeze if lowered to this temperature. Although the greater water tolerances of mixtures of gasoline with *n*-propyl alcohol give them an advantage over mixtures with ethyl alcohol if used as engine fuels, consideration must be given to the possible disadvantage of the formation of solid material which does not occur in mixtures with ethyl alcohol.